THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The excitement that showed in the pig iron market two and three weeks ago is not in evidence now. The heavy buying at that time put some producers out of the market. Others are doling out with a sparing hand what iron they have for shipment this year. It would appear that on foundry iron the product is more fully sold for 1902 than some recent figures indicated, but buyers are not stampeding the market to cover their remoter wants. The conditions are not altogether easy to diagnose, and the two views of producers are still exemplified in selling policies—on the one hand a conservatively maintained price; side by side with it the policy of asking advances as the urgency of inquiries suggests. It is a fact, however, that the bulk of the iron now being sold is on a rising scale of prices. How far consumption would outrun productive capacity if transportation troubles could be ended is the problem whose solution is most difficult. So far as the Pittsburg district is concerned—and its influence on the situation is almost commanding—the prospects for early betterment in the freight movement are not encouraging. Meantime prices are being affected, and the holding down process is not fully successful. Among recent pig iron business in the Central West are purchasers of basic iron by the United States Steel Corporation for third quarter delivery at $16 at furnace, the price paid recently for Bessemer iron for third quarter. Both irons have cut loose from this basis, however, on sales outside of the associated furnaces, as high as $17 and $17.25 at furnace being paid for Bessemer iron, while for basic some furnaces are holding for higher figures later in the year. The matter of coke contracts for the second half of the year is up with some furnaces, and $2.25 has been paid for non-Connellsville coke as against $1.90 and $2 for the first half, and it is expected that the basis for Connellsville will be $2.50 as against $2.25. Ore buying is also going on at a steady pace after the quiet interval that followed the first rush of contracting. Foreign steel is a small factor in the business of the week, but some German sheet bars have been sold for delivery in the Pittsburg district at $33. Billets from the same source sold at $31.75. The possibility of a small reinforcement of the domestic steel supply is opened up in the starting of a new independent open-hearth plant in the Chicago district, which will have 300 to 400 tons of steel a day beyond the connected finishing capacity. There seems no end to the business coming to the structural works. In the Pittsburg district the past week the contracts closed including the track elevation on the Ft. Wayne division of the Pennsylvania system, amounts to 20,000 tons. The heavy demand for wrought iron pipe is a marked feature of the situation in finished material. March, 1901, made a record in this trade, but the business done this month is already in excess of that record. Capacity in this line has increased, however, and the independent pipe mills now produce about one-third of the entire output.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, March 12.

The freight situation so far as this district is concerned shows very little improvement, and prominent railroad officials who have charge of the movement of the immense tonnage in this territory are not making any glowing promises to manufacturers as to what they will do when the weather moderates. The fact is that the railroads have not sufficient motive power and cars to move the immense tonnage in and out of this district, and even if they had, their poor track facilities would continue to be a barrier. The freight situation today is as bad as it was four months ago. Stocks at all the steel mills run into the thousands of tons, while in the coke regions several hundred thousand tons of coke are piled for want of proper railroad facilities. At present the railroads are doing their utmost to handle the immense tonnage offered them, but their great handicap in the way of inadequate and antiquated cars and locomotives and cramped yards is proving too much for them, and the tonnage moved is but little more than during the severe winter months. With the opening of the navigation season less than two months off, and the diversion of a large number of locomotives and cars into the ore and coal trade a still severer situation confronts the manufacturers of this district.

Several of the traffic managers of the largest steel plants in this vicinity predict that the situation, so far as Pittsburg and the adjacent territory is concerned, will be worse than any thus far experienced, and with the diversion of cars into the grain trade during the summer and fall months little encouragement is offered the great shipping interests of the Pittsburg district. It was firmly believed that with the improvement in transportation facilities which usually comes in the spring months the operation of blast furnaces and steel plants would greatly improve and the strain on raw materials would be removed. It seems, however, that such is not to be the case.

Many of the Northern furnacemen who have been hampered for fully five months by the railroads, not only in the receipt of their raw material, but in the transportation of their pig iron, are advancing the price of their product, and despite the fancy prices offered they are not at all anxious to sell, believing that still higher prices will rule within a few months. They claim to have carefully canvassed the situation and are of the opinion that the railroads cannot do much better than they are doing at the present time, and that only until the opening of the navigation season. Believing still further that the price of coke will be materially affected during the second half of the year, they have already commenced to place their contracts for the last six months. Several of the largest outside coke interests have disposed of their entire output of furnace coke for the second half of the year at $2.25 per ton at the oven, and while no price has been definitely fixed it is reported that the H. C. Frick Coke Co. will ask $2.50 for furnace coke for such shipment. Many foundries have also closed for their coke supply for the second half of the year at $2.75 and $3 for non-Connellsville coke, which will mean $3.10 to $3.25 for the strictly Connellsville product. Of course a great many of the furnaces covered for the year's supply in January at $2.25 for Connellsville and $1.90 to $2.25 for outside coke. Others, who believed that lower prices might come before the expiration of the first half, are now rushing to cover for the second half of the year.

All grades of Northern iron have sold at advanced prices during the week, and present indications are for still higher prices. Foreign sheet bars have sold in this territory this week at $33 per ton while foreign billets are quoted at $31.75. In the finished lines we can state that the American Bridge Co. has considerable business running into next year; that is,

the erection of much work now contracted for cannot be completed until far into the spring months. Of course on all these contracts the agreed quotations on structural material were made despite the fact that the deliveries run into next year. Both muck bar and iron and steel skelp have advanced owing to the recent advances in forge iron and in steel. The steel bar market is now wholly on a 1.60c basis although no formal agreement to hold prices at this level have been entered into. A meeting of the plate manufacturers will be held on Thursday in New York, but no change in price is anticipated.

PIG IRON.—All grades of pig iron continue to advance, and despite the fancy prices offered the furnacemen are not at all anxious about closing business throughout the second half of the year, being desirous of holding a considerable tonnage for the higher prices which they believe will rule. Foundry iron for prompt shipment commands good premiums, and we note the sale of two carloads of No. 2 at $19 at the Valley furnace. We also note the sale of 6,000 tons for delivery through the second half of the year at $18.25, Pittsburg. Forge iron for delivery in the remainder of the first half has sold at $17.50 to $17.75, Pittsburg, the largest producer having purchased a considerable tonnage at these prices. One producer of basic iron is holding the output of his furnace for the second half of the year at $18 at the furnace, believing this price will be obtainable within a few months. Yet recent contract sales for third quarter have been made at 16 at Valley furnace. Small lots of Bessemer iron for second half delivery have sold at $17 and $17.25 at the furnace. We note sales of about 3,500 tons at these prices. Recent advances in Middlesbrough No. 3 foundry makes it impossible to import for the present, as the best recent quotation is $18 per ton, ex-ship, Philadelphia. One of the two idle furnaces of the Shenango Furnace Co. at Sharpsville, Pa., will be blown in within a week or ten days, while the other furnace will go in within a month. We revise Pittsburg quotations as follows:

Bessemer, Valley	$ 6 75 to 17 25
Bessemer, Pittsburg	17 50 to 18 00
No. 1 Foundry	18 00 to 19 00
No. 2 Foundry	17 25 to 18 25
No. 3 Foundry	16 75 to 17 75
Gray Forge, Pittsburg	17 25 to 17 75
Chilled Basic, Valley	16 50 to 17 00
Chilled Basic, Pittsburg	17 25 to 17 75

STEEL.—The sale of an 8,000-ton lot of sheet bars by the largest producer noted in these columns last week was made, we are informed, upon a conversion arrangement. Further sales of steel for second half delivery have not been made during the week, but foreign steel continues in good demand. We note the sale of 500 tons of foreign sheet bars at $33, Pittsburg, and 1,000 tons of billets at $31.75, the same delivery. Rods continue scarce and are quoted $35.50 to $36 per ton.

FERRO-MANGANESE.—We continue to quote domestic manganese, 80 per cent, at $52.50 per ton, buyer's mill. Foreign ferro is held at $50 per ton.

SPELTER.—The spelter market continues unchanged, and prime western grades are held at 4.15c to 4.17½c, Pittsburg.

MUCK BAR.—There has been a further advance in muck iron, and the largest producers are now holding their product at $32. This is due to the high price of forge iron.

SKELP.—A further advance in both iron and steel skelp has been made, and iron skelp, grooved and sheared, is quoted at 1.95c, while steel skelp is quoted at 1.85c. A number of the skelp mills are not in operation for the reason that they believe that prices are not high enough and are not finishing their muck iron.

RAILS AND TRACK MATERIAL.—The rail mills continue to operate at their fullest capacity. Prices remain unchanged as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $42; 12 pounds, $38; 16 pounds, $35; 20 pounds, $35; 20 pounds, $34; 25 to 40 pounds, $32. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—A meeting of the plate manufacturers will be held in New York on Thursday for the purpose of reviewing the present situation. No change in prices is anticipated. We make the following quotations: Tank plate, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash in 30 days.

PIPES AND TUBES.—Despite the enormous outside producing capacity the National Tube Co. continues to break all former records in securing business from month to month. Discounts to consumers in carload lots, Pittsburg, are as follows:

MERCHANT PIPE.

	Blk. Per cent.	Galvd. Per cent.
⅛ to ⅜ and 11 to 12 inches	60	48
½ to 12 inches	67½	55

BOILER TUBES.

Steel.

	Per cent.
1 to 1¾ inches	47½
2¼ to 5 inches	65½
1¾ to 2¼ and 6 to 13 inches	60

Iron.

	Per cent.
1 to 1¾ and 2½ inches	43½
1¾ to 2¼ inches	43
2½ to 13 inches	53

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12¾ inches	63

BARS.—Although no formal action has been taken by the steel bar producers the market is now established on a 1.60c basis. We revise quotations as follows: Bar iron, 1.70c, Pittsburg, with full freight added to point of delivery; refined iron bars, 2c and upwards; Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under three inches, 1.70c; over 3 inches, 1.80c. Hoops and bands are quoted at 1.90c, full extras.

SHEETS.—Though there has been a heavy tonnage booked by all the sheet mills orders come in steadily and all the mills have from two to three months' business on their books. We are advised that the galvanized sheet market is also somewhat stronger than for some time. We make the following quotations to consumers: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets are quoted at 70, 10 and 5 off in carload lots; less than carload lots, 70 and 10 off.

STRUCTURAL MATERIAL.—The structural material for both the Oliver and Farmers' Deposit buildings will be furnished by the American Bridge Co., amounting to nearly 14,000 tons. The contract for the Tenth street bridge on the South Side was also awarded the American Bridge Co., calling for about 2,500 tons of material, while the new freight house of the Pennsylvania Railroad will be built by the Phoenix Iron Works. This contract calls for 1,200 tons of material. Many of the contracts recently closed by the American Bridge Co. cannot be filled before the spring months of next year, but in no instance has more than the agreed prices on structural shapes been asked for this forward delivery. On small lots nearly all the structural mills are asking and securing an advance of $5 a ton, although shipment cannot be promised before next October. Pool quotations follow: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—The demand for both wire and cut nails continues good and jobbers report that the spring demand will be heavier than ever before. We quote wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire $2.40 in carload lots; polished staples $2.20 and galvanized staples $2.60; painted barb wire $2.60 and galvanized $2.90. These prices are quoted on a Pittsburg base plus the actual freight to destination. Cut nails are held at $2 in carload lots and $2.05 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—Despite recent advances in the price of shafting a good demand continues. We quote turned, cold rolled and ground shafting in carload lots 50 off, and in less than carload lots 45 off; tire steel, 1.70c in carload lots and

1.80c less than carload lots; toe calk, 2.10c to 2.25c; sleigh shoe, 2c to 2.25c; machinery steel, 1.50c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

Old Material.—All kinds of old material continue to advance in price, and heavy wrought scrap for open-hearth purposes commands fancy prices. Our quotations gross tons are as follows: Heavy wrought scrap, $21 to $21.25; cast scrap, $16.75 to $17; iron rails, $24.50 to $24.75; car wheels, $19; cast borings, $9.50; wrought turnings, $14.25; steel rails, $19.25; steel rails for rerolling purposes, $24.

Coke.—Nearly all the large outside coke producers have disposed of their output through the second half of the year at $2.25 for furnace and $2.75 to $3 for foundry. Strictly Connellsville coke, on this basis, would sell at $2.50 for furnace and $3.25 for foundry for this delivery. For the week ending Saturday, March 1, the estimated production of the Connellsville region according to the Connellsville *Courier* was 215,209 tons, a slight falling off from the production of the previous week. The total output for the month of February is estimated at 919,239 tons, an increase over the output of the same month last year of 78,509 tons.

CHICAGO.

Office of *The Iron Trade Review*,
934 Monadnock Block, March 11.

The activity in iron and steel circles shows no decline, though the excitement of a few weeks ago has disappeared. Consumers who were then anxious to place their orders for fall delivery, in view of the reported shortage of iron, being reassured that their wants will be taken care of at the proper time, have gradually withdrawn their inquiries, and the tone of the market has improved correspondingly. There is, however, a great scarcity of iron for spot delivery, which is true also of all kinds of finished product. Deliveries within three months command a premium, which varies according to the tonnage desired. There is no improvement in the coke supply, the receipts in the past week being less than for many weeks.

Pig Iron.—The local situation is of an anomalous character. Most of the furnaces are sold up for the third quarter, and some to the end of the year. None are very anxious at the present time to sell any more iron, and all the agents in this city have instructions to submit all inquiries to the furnace before bidding on them. There has been no sustained advance, but in view of the conditions existing, the price of iron varies in the different offices, according to the tonnage on the furnace books and the status of the buyer with the seller. Local No. foundry, for delivery within three months, sells at $19 to $20, and for future delivery, $18 to $18.50. The same grade of Southern iron for spot delivery commands $18 to $19 a ton, and on long time contracts $17.15 to $17.65. Some furnaces, however, report they are selling iron to old customers at the quotations which were in force before the scarcity became so pronounced. The buying in the past week has been active, though no large orders are reported. The tonnage would have been much larger had the furnaces the iron to sell. The scarcity of coke continues to seriously retard both production and consumption, and it is reported a number of foundries have been compelled to shut down owing to lack of fuel. Our quotations which follow have been advanced on some grades, though these prices may be shaded on orders for delivery late in the year.

Lake Sup. Charcoal	$20 00 to $21 00	Southern Coke No. 4	$15 65 to $15 90
Local Coke Fdy. No. 1	18 50 to 19 00	Southern No. 1 Soft	16 15 to 16 40
Local Coke Fdy. No. 2	18 00 to 18 50	Southern No. 2 Soft	15 55 to 15 90
Local Coke Fdy. No. 3	17 00 to 17 50	Southern Gray Forge	14 65 to 14 90
Local Scotch Fdy. No. 1	18 50 to 19 00	Southern Silveries	16 65 to 17 65
Local Scotch Fdy No. 2	18 00 to 18 50	Jackson Co. Silveries	18 00 to 18 50
Southern Coke No. 1	17 65 to 18 15	Ohio Strong Softeners	18 50 to 19 00
Southern Coke No. 2	17 15 to 17 65	Alabama Car Wheel	20 50 to 21 00
Southern Coke No. 3	16 65 to 17 15	Malleable Bessemer	18 50 to 19 00

Bars.—It is impossible to obtain bars for delivery this side of July, and in some cases mills are sold up for the third quarter of the year. There is an active demand for all sizes, and manufacturers report that no difficulty is experienced in getting orders at the recent advance. Consumers everywhere are specifying heavily on their contracts, which in the majority of cases have proven insufficient for their needs. We quote iron, 1.85c Chicago; steel, 1.75c; out of store 2.10c.

Sheets.—There is no lack of business being offered, and mills report they have all they can take care of. Shipments from Eastern mills have been retarded by the floods and scarcity of cars, and the tonnage received in this city is not adequate for the demand. Prices are firm and of an upward tendency. We quote No. 27 black from store, 3.30c to 3.40c, and galvanized, 70 per cent to 70 and 2½ per cent.

Structural Steel.—Only such concerns as are regular customers of mills can get structural shapes in this market, and these are limited to those who have contracted to erect buildings and have the plans prepared. No guarantee as to delivery can be made, the mills promising to do the best they can under the circumstances. The demand for shapes of all kinds and sizes is very large, and jobbers are getting the bulk of this business. They report their stocks are rapidly diminishing. We quote mill shipments, carload lots, as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; angles, 6x6 and under, 1.75c; over 6x6, 1.85c; plates, 1.75c; base, tees, 1.80c; zees, 1.75c; lots from store, angles, 2.50c, minimum; tees, 2.55c, minimum; beams and channels, 2.50c per pound, minimum.

Rails and Track Supplies.—We have advanced our prices on track supplies 10 cents per hundred. All the mills are sold up for six months on these materials; on heavy rails, deliveries cannot be made before November, and on light rails, within three to six months. We quote as follows: Standard rails, $28; light sections, $34 to $36, according to size; out of store, $40 to $44; splice bars, 1.80c to 1.90c; spikes, 2.15c; track bolts and hexagon nuts, 2.90c to 3.90c, out of store 3c to 3.10c; square nuts, base, 2.75c to 2.85c; out of store, 2.85c to 2.95c.

Billets.—There is no decrease in the number of inquiries, but the mills, having no steel for sale, are not quoting. We quote Bessemer billets, $31 to $33; open hearth, $33 to $35.

Merchant Steel.—A few contracts have been closed in the past week, but owing to the condition of mills the tonnage sold is not of large proportions. There is an active inquiry for all kinds of material, many consumers finding the contracts made several months ago insufficient for their needs. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c, which can be shaded on carload lots; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe, 1.65c to 1.80c, flat sizes; concave and convex, 2c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 2.40c to 2.60c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 per cent to 10 per off, Chicago; less than carload lots, 45 per cent off, Chicago. cent higher; cold rolled shafting, carload lots, 50 per cent

Plates.—There is an active demand for plates from store, and on small orders prices have been advanced. The local mill reports it has orders on its books sufficient to last it three months, and that specifications against old contracts are heavy. We quote as follows, Chicago delivery: Tank steel, base, ¼-inch, 1.75c to 1.85c; flange steel, 1.90c to 2c; marine steel, 1.95c to 2.10c; firebox steel, ordinary, 2c to 2.10c; special, 2.25c and upward. Jobbers are selling from store according to size as follows: Tank steel, 1.90c to 2c; flange steel, 2.10c to 2.25c; marine steel, 2.40c to 2.50c; firebox steel, ordinary, 2.40c to 2.50c; special, 2.50c and upward.

Cast Iron Pipe.—The local interest closed an order for 9,000 tons in St. Louis last week. Orders from all parts of the west are growing more numerous and of larger tonnage. Prices are very firm, as follows: 4-inch water pipe, $29, carload lots, f. o. b. Chicago; 6-inch water pipe, $28; 8-inch and larger sizes, $27; gas pipe, $1.00 per ton higher than above prices.

Merchant Pipe.—Manufacturers report a constantly increasing demand, and a good tonnage has been closed in the past week. Our quotations follow:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ⅜ in.	58½	46½
¼ to 12 in.	66	53½

BOILER TUBES.

	Steel Per cent.	Iron Per Cent.
1 to 1¼ in.	40	35
1¼ to 2½ in.	47½	37½
2¾ to 5 in.	57½	47½
6 in. and larger	45	40

Wire and Wire Nails.—The local interest reports the volume of business very large, and that its entire production goes immediately into consumption. We quote as follows: Smooth wire, carload lots, $2.15; painted barb wire, $2.75;

galvanized barb wire, in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots, $2.30; jobbers' prices to retailers, 10 cents higher than above for carload lots, and 20 cents for less than carloads.

COKE.—There is no improvement in the coke supply, and in the past week the receipts fell to a lower level than for many weeks. For two days, no Connellsville coke was received in this city, owing to the heavy rains and floods in the east, and as a result, a number of foundries and other manufacturing plants had to shut down. Spot coke sells at $6.25 to $6.50.

OLD MATERIAL.—Owing to the scarcity of pig iron and to a combined effort on the part of dealers to bull the market, scrap of all kinds is in great demand, and prices have of late been advancing rapidly. We quote as follows:

Old iron rails	$22 50 to $23 50	Relaying rails	27 00 to 28 00
Old steel rails, 5 ft. and up	23 00 to 23 50	Old wheels	$17 50 to $18 00
Old steel rails, mixed	16 00 to 17 00	Heavy melting steel	15 50 to 16 00
		Mixed country steel	11 00 to 11 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$17 50 to $18 50	Steel Axles	$18 50 to $19 00
No. 2 R. R. wrought	16 00 to 16 50	Cast borings	6 50 to 7 00
Dealers' forge	14 00 to 15 00	Wrought turnings	12 00 to 12 50
No. 1 busheling	12 50 to 13 00	Iron axle turnings	13 00 to 13 50
No. 1 R.R. & mach. cst.	13 50 to 14 00	Steel axle turnings	12 00 to 12 50
Railway malleable	13 00 to 14 00	Stove plates	10 00 to 10 50
Country malleable	12 00 to 12 50	Old iron splice bars	18 00 to 18 50
Iron axles	22 00 to 22 50		

CLEVELAND

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, March 12.

Following the first rush of business on the opening of the ore market for 1902 last month there were two or three weeks of quiet. This in turn has been succeeded by a period of steady buying, not in large contracts, but in lots of from 5,000 to 25,000 tons. Early buyers have become sufficiently assured as to their year's operations to add to their original orders, making further purchases of the same ores where these are still on the market, or when necessary piecing out with other ores. The advance over 1901 on non-Bessemer ores and on all Mesabi grades has been maintained, but there has been no other advance that would take account of the advance in pig iron.

In the lake freight market matters are still drifting. An early opening is now predicted, and the adjustment of questions that come up between the dock companies and the longshoremen's union is not likely to develop any serious friction, last year's rates being in the main satisfactory. The large interests that have offered 75 cents for tonnage have done nothing as yet, and the duration of the deadlock is uncertain.

PIG IRON.—The local market is quieter and buyers are not showing the nervousness apparent in some quarters only recently. Covering for the second half is still under way, but buyers in many cases are prevented from getting full supplies by the attitude of certain sellers. One Southern interest is not quoting for second half, though credited in some reports with having considerable iron to sell for this year's delivery. The price of $12 Birmingham is nominal under the circumstances, and furnaces that have iron to offer get $13, considering that this is not out of reason under such conditions as are present. Orders for early delivery continue to come in, and whenever filled bring a premium. There will be not a little iron wanted for second quarter, but it is not now plain where it is to be had. Strike talk increases in local machinery foundry circles. The molders have decided to strike for the $3 minimum, but the employers show no sign of granting the advance. A bitter struggle seems to be ahead. Recently Cleveland's consumption of foundry iron has increased and further additions are being made to foundry capacity. Some sales of basic iron have been made in the week at $16, Valley furnace, deliveries in the third quarter. This is considered a conservative level in view of the price of Bessemer iron and the fact that gray forge iron is sold at $16.50 to $16.75 in the Valley. Fourth quarter sales of basic are expected to be made shortly. There is a continued scarcity of gray forge and the Valleys are scoured for any off products of basic, Bessemer and foundry furnaces, the off irons bringing more than the contract iron on which the furnaces are running. Bessemer iron continues to bring prices from 75 cents to $1 in advance of the last contract sales, which were at $16. We quote the Cleveland market:

Bessemer	$17 50 to $18 00	Scotch No. 1	$17 50 to $18 50
No. 1 Strong F'dry	17 50 to 18 50	Scotch No. 2	16 75 to 18 00
No. 2 Strong F'dry	16 75 to 18 00	Gray forge, Valley	16 50 to 16 75
No. 3 Foundry	16 75 to 17 25	Lake Superior charc'l	20 00 to 21 00

FINISHED MATERIAL.—There has been no pronounced feature in local buying, but in nearly all lines it keeps up, with all indications that more pronounced activity will come on the opening of spring. In sheets stocks have been accumulated in second hands, but the open season movement is not a feature yet. On light gauges mills are better able to make deliveries now, some of them in two weeks from receipt of specifications; on heavier gauges their best promise is four weeks. The increased capacity for galvanized sheets has been felt through the winter in prices relatively lower than on black sheets. On the latter an occasional shading of price on large lots is reported, a mill west of Pittsburg, for example, giving a customer nearer to it than to Pittsburg the benefit of the difference in freight. Cleveland deliveries are on the basis of 3.10c for No. 27 to consumers, where shipments are made from mill. Out of store the range of prices continues to be about as follows: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3.10c; No. 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 25-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c. The above are for one pass through cold rolls. For full cold rolled the extra is .10c. Galvanized sheets are quoted 70 to 70 and 10 off list. The situation in structural material is unchanged, except that on small angles better deliveries are being made. On sizes from 3 to 6 inches the supply is not equal to the demand. We quote beams and channels at 1.70c, Cleveland, and from stock 2¼c, with extra charges of ¼ to ¾c for cutting to length. Bars are in steady demand, and there is now but one minimum on steel—1.68½c, Cleveland for Bessemer, while open-hearth bars are 1.78½c, Cleveland. Specifications are steadily going in to the mills, in addition to a fair tonnage of new business at the advance. Bar iron is still sold at 1.78½c, Cleveland, and at 1.90c out of store. The wrought pipe trade is active with the mills and the indications are that dealers will soon be busy.

OLD MATERIAL.—The prices of some varieties of scrap have been advanced in the week under the heavy demand. No. 1 railroad wrought and cast borings are higher, and in other cases the effort to get prompt material has led to the payment of premiums, a real scarcity developing in some lines. We quote Cleveland delivery, all in gross tons, as follows:

Old steel rails, rolling mill lengths	$17 50 to 19 00
Old steel rails, short lengths	6 00 to 17 00
Iron rails	23 00 to 24 00
No. 1. railroad wrought	17 50 to 19 00
Mill scrap	15 50 to 17 00
No. 1. machine scrap	15 00 to 15 50
Machine shop turnings	13 00 to 13 50
Cast borings	7 50 to 8 50
Grate bars	9 00 to 10 00
Sheet iron	9 50 to 11 00
Stove plate	10 00 to 11 00
Car wheels	16 00 to 17 00
Heavy steel scrap	17 00 to 17 50

CINCINNATI.

March 12.

The elements of strength that have been conspicuous in the iron market are still evident. There is no present indication of a let up in demand or decline in price. The situation is considerably easier in pig iron, though as much cannot be said for the market for finished material. In the South there is less trouble in getting labor, and furnaces find their coke supply large and the car supply much better than it was. Northern conditions are also improved. Manufacturers in all lines using finished material are having good business, and report no cessation of orders. Deliveries are quite slow, and this very fact compels manufacturers to go into the market far ahead. That they are willing to do this is a good indication of their confidence in the future.

PIG IRON.—The demand for pig iron has been good, and while deliveries cannot be promised until the latter part of the year the aggregate of orders has kept about the same rate as for some months past. During the past week there were some orders placed for iron to be delivered in January, 1903. So far as is known this is the first business that has run over into the new year in this district. An order for 2,500 tons of basic was placed this week for delivery August to October, and there has also been a continued good demand for car wheel iron, and it is in good order to state that if there is any trouble in getting iron for delivery even during the latter part of the year, it is in this grade on which there has been a good demand all season. Prices remain the same, the nominal quotation for No. 2 Southern foundry being $12

Birmingham, but $13 is obtained in most cases. Iron is sold for immediate or early delivery at good premium. Quite an order for gray forge was placed the past week at $12.50 Birmingham. It is stated that a number of furnaces are now unable to make deliveries this side of November. Prices at Cincinnati are as follows:

Southern Fdy. No. 1	$15 25 to $16 25	Gray Forge	$13 75 to $14 75
" " 2	14 75 to 15 75	Northern Fdy. No. 1	17 85 to 18 60
" " 3	14 25 to 15 25	" " 2	17 35 to 18 10
" " 4	13 75 to 14 75	Southern C.W. iron	20 00 to 20 50
So. Fdy. No. 1 soft	15 25 to 16 25	Malleable coke iron	17 60 to 18 10
So Fdy. No. 2 soft	14 75 to 15 75		

FINISHED MATERIAL.—The market for finished material shows no change. Advanced prices made effective last week are still maintained, and the demand has not been curtailed in the least. Consumers of bar iron and bar steel are in the market heavily, and all other kinds have been taken in the same proportion. Structural iron handlers report that they are not able to promise satisfactory deliveries at all. Prices of iron out of store have not been changed. Quotations at Cincinnati: Bar iron, 1.82c; bar steel, 1.72c. Other materials remain unchanged.

OLD MATERIAL.—The market for scrap shows no change. Dealings have been good, though no large transactions are noted. Prices are:

Old No 1. Wrought Railroad, net tons	$ 16 00 to 16 50
Cast Machine and Foundry, net tons	12 50 to 12 75
Old Iron Rails, gross tons	21 50 to 22 00
Old Steel Rails, gross tons	18 00 to 18 25
Old Short Lengths, gross tons	15 00 to 15 25
Old Iron Axles, gross tons	21 00 to 21 50
Old Iron Car Wheels, gross tons	16 00 to 16 50
Stove Plates, gross tons	9 75 to 10 00
Wrought Turnings, net tons	11 50 to 11 75
Cast Borings, net tons	5 50 to 6 00

PHILADELPHIA.

March 11.

Consumers continue to be greatly embarrassed by the unusual delays in delivering material, and many have reached the point where if they are not forced to a complete shutdown, they will at least be compelled to operate with a reduced working force. Naturally such conditions make prices very erratic, and while they may not reach a higher level, no one gainsays that the opportunity exists for a great jump. The trade in general is against further advances, but those who hold material are the ones who will say what policy shall be pursued. The attempt to obtain some relief from abroad has not been very successful as prices there have advanced in sympathy with our own until importation is practically checked. Almost the only direction in which to look for improvement is the transportation facilities, and these have again been interfered with by the elements, and further hampered an already crippled service.

PIG IRON.—With all grades of iron commanding a premium for deliveries this side of July, it is really more of a question to find this much sought article than to agree upon a price for it. A few furnaces may have rather small amounts of iron in stock, yet these would be quickly cleaned out if cars could be found to carry them away. Every seller is practically a law unto himself in the matter of price. Sales are recorded at $19 for No. 2 X foundry to be delivered during March and April, and the range of values for this side of July is about as follows for Philadelphia and nearby points. No. 1 X foundry, $19.50 to $20; No. 2 X foundry, $18.75 to $19.25; No. 2 Plain, $17.50 to $18; standard gray forge, $17.50 to $18; ordinary gray forge, $17 to $17.25; Basic (chilled), $18.25 to $18.50. For deliveries during the last half of the year a reduction of $1.50 to $2 per ton from these figures appears to be ruling. However, there is but little iron offered and inside facts of actual transactions are not obtainable.

FINISHED MATERIAL.—There is a heavy consumption of plates and mills have their order books well filled. Although nominal quotations continue to be quoted for structural material, it is well known that from $4 to $6 per ton premium is readily paid, where reasonable deliveries can be arranged for. The bar trade is expected to be less active since the advance was made, but the mills have all the business they can take care of for a long time to come. Prices are about as follows for city and seaboard deliveries: Plates, ¼-inch and thicker, 1.75c to 1.80c; bars, iron or steel, 1.72½c to 1.80c; angles, 1.75c to 1.85c; beams and channels, 1.75c to 1.85c.

OLD MATERIAL.—Extreme scarcity prevails and prices are difficult to quote, although customers show a willingness to pay higher prices where deliveries can be guaranteed.

The range of bids and offers is about as follows for deliveries in buyers' yards: Choice railroad scrap, $22.50 to $23.50; ordinary light scrap, $13.50 to $14; machinery cast, $15.50 to $16.50; heavy steel scrap, $19 to $20; old iron rails, $22 to $23; wrought turnings, $14.50 to $15; cast borings, $8.50 to $9; old iron axles, $25.50 to $26; old steel axles, $22.50 to $23; old car wheels, $17.25 to $17.75.

THE FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, in Philadelphia, on Wednesday, March 5, the president, Thos. I. Rankin, occupying the chair. Notwithstanding the inclement weather there was a fair attendance.

The question of incorporation of the association came up for discussion, but the matter was deferred pending the amendment of the constitution in order to make the step possible.

M. J. Drummond & Co., 192 Corbin building, Broadway, New York, were elected to membership in the association.

The paper of the evening was presented by Howard Evans, of the J. W. Paxson Co., Philadelphia, the popular secretary of the association, on "The Charlier Oil Fuel Brass Furnace." The paper fully covered the points in the construction and operation of this furnace, as set forth in the article appearing in our issue of February 27. Supplementary to the paper were presented lantern slides showing the furnace and a rig for phosphorizing metals, the furnace during the act of pouring, and the pump rig for supplying the oil fuel. Slides were also shown of the Schwartz melting furnace for brass foundries, and a furnace made in England for use with crucibles. The phosphorization of metals in the furnace was fully explained. The phosphorizer, with a weight on it, was seen to be suspended from an overhead pulley attachment, so that the churning of the metal could be easily and thoroughly done.

Discussion.

Stanley G. Flagg, Jr.: What is the loss in melting?

Mr. Evans: I am told by users of the furnace that it is not greater than 1 or 2 per cent.

Mr. Flagg, (addressing the inventor, who was present): Mr. Charlier, would you guarantee the loss to be not greater than 3 per cent?

Mr. Charlier: I think 1 per cent would cover it. In my claims I state generally that the loss will not exceed 2 per cent.

Mr. Davis: Can you see clearly when the metal is ready for pouring?

Mr. Evans: Certainly. Just roll the furnace over.

Mr. Hanson: Would it be a good thing for babbitt?

Mr. Evans: Yes, anything at all. And another thing, the heat is entirely within the control of the operator.

A member present said he had looked into the claims made for the furnace and had made some comparisons with the costs experienced with the coke furnace operated by him. He said his weekly cost for heats averaging 5,000 pounds per day, in point of fuel, was $152, while the cost of running the same meltage in the Charlier furnace could not be more than $83.20. Quite a difference in favor of the furnace. Again, he said, he used about 24 crucibles per month, which cost about $75, as against the expenditure of $16 for a much longer period in the wear of furnace linings.

After the meeting the members and guests sat down to the usual luncheon and an hour or two of speechmaking was indulged in.

Important Steel Corporation Work in the Pittsburg District.

Extensive improvements are to be made in the Pittsburg district by subsidiary companies of the United States Steel Corporation. The doubling of the capacity of the armor plate plant at Homestead has already been referred to in these columns. An angle mill is also to be erected at Homestead, as well as a new bridge plant for the American Bridge Co. Improvements on the Bessemer railroad will involve an expenditure of several hundred thousand dollars. The total cost of the improvements referred to will be about $5,000,000. It is reported also that an additional expenditure will be made on new work at the Neville Island plant of the American Steel & Wire Co., but this has not been officially confirmed as yet.

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THE PREMIUM SYSTEM IN RAILROAD WORK.

That a rose is equally fragrant under a change of name is suggested by some pertinent remarks by Mr. F. A. Halsey in an address before the mechanical engineering students at Cornell University. Mr. Halsey is reported in the *American Machinist* as saying that the premiums paid under his system of remunerating labor in accordance with the simple principle of paying what is necessary but no more, are in no sense bonuses or gratuities, but on the contrary they are in the fullest sense of the word earnings. In this discussion of the true meaning of the premium plan the author has this to say:

> It should be said that the name premium plan is not and never has been entirely satisfactory because the term premium carries with it the idea of a bonus or gratuity. I searched the English language through for a better term, and for a time had a leaning toward the term dividend plan because the word dividend implies a division of something that has been earned. The word is, however, identified with a division of profits, and to have used it here would have involved confusion with the profit sharing plan. The word premium was therefore adopted, not because it was satisfactory, but because it was less unsatisfactory than any other available word.

The word premium certainly carries with it the idea of recompense for superior production, substantial recognition of excellent performance, and is sufficiently broad to cover the finer distinctions if not indeed all the suggested improvements offered during the last decade to this automatic method of grading wages. Other plans have been brought forward from time to time in this country with the expectation of superseding existing methods but the premium system seems to acquire vitality with the passing years and has demonstrated its capacity for usefulness outside the work shop. How far it is capable of extension to purely clerical employments is a matter of opinion, but it is a fact that a similar system to the one devised by Mr. Halsey is in vogue on some of the railroads of Southern Europe and the method is freely applied to the clerks there. The Department of Labor, Washington, D. C., has issued a bulletin upon the condition of railway labor in Italy which gives some highly interesting information about a premium plan and its operations under Government control.

The railroads in Italy were formerly in the hands of private companies and later were gradually acquired by the Government, whose administration does not seem to have been altogether satisfactory, and in 1884 the railroads were leased to operating companies upon a percentage basis. The operating company in each case provides for the current expenses of operating the railroad while the state as proprietor provides for maintenance and extension of the rolling stock, track and buildings. The tendency of the companies to economize on the railway personnel has led to the adoption of systems of remuneration which would tend to increase the amount of labor performed by the individual employe and to diminish the cost of that labor. Some of these systems like the supplementary wage system and the task or piecework method are still used by nearly all other European railways, but there is one system which outside of Italy seems to have been adopted only, and that to a slight extent, by the Austrian Southern Railway (Sudbahn). This has, however, in Italy gained the greatest importance in railroad work. This method has a designation, in the essay by Dr. Luigi Einaudi treating upon this subject, which has been freely translated as the gain-sharing system. It is in effect an Italian conception of the premium plan, and as Dr. Einaudi says, by way of excuse for his detailed treatment, "It is believed that it may prove of value to those who occupy themselves with the problems of labor and the methods of dividing the total products of industry between labor and capital." It will be noted that the translator had the same difficulty in obtaining a suitable word for the English equivalent and found it safer to coin a compound term for that purpose.

As the three terms, supplementary, task and gain-sharing systems, have been mentioned it may be well to submit some general classification of the methods incidental to each in order that the reader can the more readily compare them with wage-earning plans elsewhere. Supplementary wages may be optional in character: Extra compensation paid to employes on the clerical force; premiums granted for meritorious service; rewards for promptly turning in lost or forgotten objects, for acts tending to prevent accidents or delays in the running of trains, for discovering abuses in the use of freight cars, for proving violations of the railway regulations, for lubricating and repairing railway stock, for economy in the use of supplies in the stations, and to the warehouse employes for regularity in the distribution of fuel; gratuities for telegraphic service; compensation for extraordinary labor; warm drinks. The second class of supplementary wages contains those paid on account of peculiar conditions of time and locality: Indemnity on account of malaria, compulsory absence from home, isolation, wagon and horseback service, transfers, night service; increased pay on account of greater cost of the necessaries of life, employment in thickly settled localities, confining service, for wood during the winter season. The last class of supplementary service depends more directly upon service performed: Indemnity corresponding to hours of labor, compensation for labor which prevents an uninterrupted rest of at least six hours, for lodgings, for distance run, for tunnel service, for service as substitutes, for labor of a character superior to that pertaining to the grade of the employe, for the services of some classes of employes such as storekeepers, gatekeepers and switchmen; premium for economy in the use of fuel and lubricating material, for time gained, for keeping locomotive in good condition, for careful use of materials, for careful handling of freight; compensation for helping at the turntables or sidetracks, for care in the use and preservation of tools. The above statement is descriptive of the classification adopted by the Mediterranean system and with few changes it is in use on the other railroads.

The task wage system has been extensively adopted, and in the handling of freight on slow moving trains the employes are credited with a fixed amount for a certain unit of labor. At the end of the month the amounts so credited for labor performed are summed

up; from this total are then deducted the amounts set down as the regular and supplementary wages of the permanent force (not including wages of temporary employes), the cost of the yard service, expenditures due to losses or damages and finally a fixed amount for wear and repair of tools. If after the deduction of these items there remains a surplus, a portion of it, usually varying from 20 to 35 per cent, is distributed semi-annually among the employes. The distribution of this part of the surplus is based upon the quantity and quality of the labor performed by each participant. This basis of distribution is not made known to the employes. They know the value of each unit and the number of units of labor performed, but are ignorant of the proportion of the surplus which each will receive, and Dr. Einaudi points out that this amount should really be regarded as a gratuity rather than a participation in the profits. The gain as applied to the work of general inspection of the track is computed according to the days of labor saved as compared with the number considered necessary and just. The calculation is made on the basis that each employe must examine daily a certain length of track and an amount equal to a part of the value of the time thus saved is distributed among the employes. Labor in the workshops may gain in earning capacity and wages and the two are regulated by an arrangement based upon the difference between the price of a piece of work, as agreed upon by the company and the workmen, and the actual cost of labor necessary to execute it. Should this difference be against the workmen, which occurs only in exceptional cases, then the participants in the task must reimburse the company to that extent. This reimbursement may, however, be remitted if it can be shown that the deficit was due to lack of skill and not to negligence. Besides this task wage depending upon the cost of a piece of work, there is still another called a premium, depending upon the time required to do the work. This premium increases the wages of each participant (by one-tenth to one-fifth in the Adriatic system) if the task is completed before a stipulated time. In the coal depots the premium consists of a uniform allowance for each ton handled above a fixed number of metric tons established as a normal day's work. At each office or station an annual allowance is made for certain objects of regular consumption and for stationery. The clerical force is entitled to 50 per cent of the amount saved over and above this allowance. It may be stated that in consequence of the adoption of this system the amount of $90,722.22 was paid in premiums on the Mediterranean system for the three fiscal years, 1893 to 1896, to the employes participating in the profits arising from the economic use of materials of construction.

The gain-sharing system is of course closely akin to the task-wage plan. The former is said to have been introduced in Italy in 1891 by the Adriatic company which took as a model, with some modifications, the plan of the Austrian Southern railroad. The present writer has been unable to get any detailed description of the Sudbahn system as followed in Austria; it seems of many years standing and not nearly so thorough as the extended method developed in Italy. The Adriatic company, which was the first to introduce the system, decided to leave the fixed and supplementary wage scale untouched and the problem became the old query of increasing the productiveness of the clerical and laboring force and at the same time compensating the employes by an equitable division of the savings realized through the increased intensity of labor caused by the new arrangement. The units of time required for many of the operations in the routine work were established, the time for the issuance of a ticket, checking baggage, transmission or receipt of a telegram, etc., was allotted so many minutes and for other clerical work, correspondence, etc., there is allowed for each office over and above the units indicated a certain length of time equal in value to 20 per cent of the total daily labor of the station. The system requires, therefore, the establishment of a compensation of a uniform fixed allowance for each operation, on the basis of which there is prepared for the station a monthly balance sheet of the service on the gain-sharing plan and this determines the premiums due the employes participating.

This variation of the premium plan, as it is known in this country, has been necessarily more complicated in practice than even the above description would indicate. The division of premiums could not be made in equal shares among the whole personnel without committing an injustice to the most capable and most active. The division has therefore been made on two grounds, the one keeping account of the capabilities of all of the employes and the other which takes into consideration the number of days at work. These premiums are paid monthly.

The two premium systems, the one in use on the railroads of Italy, Austria, and the other countries and the method which Mr. Halsey has developed have common features and yet they are essentially different. The one aims at the subdivision of an army into efficient regiments, the other is based upon bettering the opportunities for the individual to excel. Collective sharing of premiums naturally leads to jealousy between men of different grades and it is not surprising that along with the savings of the companies and the distribution of premiums among the men there is great dissatisfaction abroad. The system as an application of the premium idea is of very general interest and the details of its use are clearly set forth in the bulletin of the Department of Labor from which the writer has freely quoted. The account is likely to suggest anew the propriety of foremen sharing in the premiums earned by the men. This has proved one of the greatest obstacles to the smoothness of operations in European railroad service, and it is worthy of note that Mr. Halsey does not seem at any time to have advocated this extension of his plan; certainly not in his earlier writings on the subject. R. I. C.

THE COST OF OPEN-HEARTH AND BESSEMER PLANTS

It seems to be the habit to consider that the great amount of new erection of basic open-hearth steel plant, against the inactivity in Bessemer converter building, is due in considerable part to the smaller amount of capital involved in open-hearth operations. There is not so much in this assumption as commonly credited. It is true that very small open-hearth plants can be built, but as regards capacity relative to Bessemer their cost is high. And it is not true that there is much building of very small open-hearth plants. Last week we presented a summary of plants under construction. Nearly every one of these involves expenditures which would cover the cost of a fair sized converting plant, if the builders had desired to use this process, with its much greater output. Roughly speaking, the money that will build a complete open-hearth plant of eight 50-ton furnaces will build a complete Bessemer plant containing two 15-ton converters, but the capacity of the latter plant would be between three and four times that of the former. The fact that so much money is being spent in open-hearth plants, despite the much greater cost per ton of output, is a strong indication, not only that the process presents decided advantages in operation, and in the materials that can be utilized, but also that it is regarded as the process of the future. More and more the consumption of steel is extending in lines which demand the open-hearth product.

In our issue of Feb. 27 we announced the purchase by the Alabama Steel & Wire Co., of Birmingham, Ala., of 4,000 acres of steam and coking coal lands in the Birmingham district. It is now authoritatively stated that the company has closed for 4,000 acres of the richest iron ore lands in the district—another step in a program that will give it an independent position. These purchases point to blast furnace, coke oven and steel works construction.

PERSONAL

Wayne Wills, formerly a salesman with Rogers, Brown & Co., Chicago, has accepted an engagement with the Republic Iron & Steel Co.

Charles E. Dinkey, assistant general superintendent of the Edgar Thomson steel works and blast furnaces at Braddock, Pa., accompanied by his mother, left last week for a four months' trip of the South to include Florida, Cuba and Porto Rico.

David Baker has been appointed successor to A. J. Moxham as general manager of the plant of the Dominion Steel & Iron Co., of Sydney, Cape Breton. Mr. Moxham recently tendered his resignation as manager, but retained his official connection with the company.

A. W. Thompson, president of the Republic Iron & Steel Co., accompanied by J. F. Taylor, treasurer and vice-president of the concern, spent several days in Youngstown, O., last week. Proposed improvements to be made in the plants in the Youngstown district, were responsible for their visit.

General Manager Adams, of the Muncie, Ind., plant of the Republic Iron & Steel Co., has resigned and will probably be succeeded by Thomas J. Hanley, superintendent of the Highland Iron & Steel Co., of Terre Haute, Ind.

At the annual meeting of the American Radiator Co., Joseph Bond, C. M. Woolley and Charles N. Hodges, whose terms as directors had expired, were unanimously re-elected. James B. Dill was elected to the board to succeed William H. Hill, resigned.

Mr. T. A. Beattie, who recently resigned as assistant superintendent of the Boston Iron & Steel Works of the National Tube Co., McKeesport, Pa., has been succeeded by W. K. Herwig, of the National Rolling Mills. Mr. Frank Carroll has been made foreman of the continuous mill and plate mill, succeeding Mr. Herwig. Mr. John Lynch has been made foreman of the 13, 19 and 22 inch mills, succeeding Mr. Carroll. Mr. Hugh Pendleton will succeed Mr. Lynch at the Boston plant.

R. T. Crane, president of the Crane Co., Chicago, recently made an investigation in regard to the value of an academic education for young men, who have to earn their own living, and who expect to pursue a commercial life. In this connection, he sent out letters of inquiry to a large number of prominent business men throughout the country, as well as college presidents and graduates, and has published the results of this investigation in pamphlet form for private distribution.

H. F. Hall, who has represented the Pressed Steel Car Co., in Cape Town, South Africa, for the past year, returned to Pittsburg last week. He went to South Africa to set up 167 steel cars for the Rand mines near Johannesburg.

Samuel G. Moffitt has resigned the superintendency of the open-hearth plant of the National Steel Co., at Sharon, Pa., and has accepted a similar position with the LaBelle Iron Works, Steubenville, O.

The laboratory of chemistry and metallurgy, the gift of James A. Gayley, of the United States Steel Corporation, to Lafayette College, Easton, Pa., will be dedicated with appropriate ceremonies on April 5.

Ambrose Monell, assistant to the president of the Carnegie Steel Co., National Steel Co. and American Steel Hoop Co., accompanied by I. W. Jenks, general superintendent of the American Steel Hoop Co., and C. Slick, the chief engineer of the same company, made a tour of inspection through the Warren, Girard, Greenville and Youngstown plants of the hoop company last week.

Austin Kelly has been appointed assistant superintendent of the steel plant of the Ashland Steel Co., Ashland, Ky.

American Tools Reduce a Time Record 75 per cent.

Armstrong Bros. Tool Co., of Chicago, reports a marked increase recently in the export demand for tool holders. The company recently established agencies in Australia and New Zealand, which give promise of developing into important markets for the company's product. Some time ago Nestor Johnson was sent into Norway, Sweden, and Denmark to investigate those markets, and to introduce the Armstrong tools. Mr. Johnson is a native of Norway and a practical mechanic. He recently returned to Chicago after placing the Armstrong agency for the countries of Norway, Sweden and Denmark with the firm of C. S. Christensen, of Christiania, Norway. He had many interesting experiences while traveling in the company of one of C. S. Christensen's engineers, visiting the largest machine shops in the countries above named. One of the most interesting of these occurred at the plant of the Moss Mechanical Works, at Moss, Norway, while making a demonstration of the Armstrong gang planer tool. The subject of the test was a large cast iron plate used in connection with pulp mill machinery, and Supt. Olsen stated that the regular time on this job was seven hours. Mr. Johnson and the gang planer tool finished it in just 1¾ hours.

Strike of Cleveland Machinery Molders.

A conference was held in Cleveland on March 6 and 7 between a committee of officers of the Iron Molders' Union and a committee from the National Founders' Association, to adjust if possible the wage difference that had come up in Cleveland machinery foundries. The demand of the machinery molders was for a $3 minimum as against $2.75 now in force. One year ago the Cleveland molders asked for an advance to a $2.85 minimum, but a special conference on the Cleveland situation resulted in no agreement, and while the molders were disposed to strike their national officers advised against this. At the same time a conference between committees of the two organizations over the situation in Milwaukee, Detroit, St. Louis and Cincinnati resulted in an agreement on a $2.85 basis, and the Cleveland molders, arguing that they should have had the same minimum that was made for these cities, have been preparing for a decided stand this spring. At the conference last week the foundrymen offered to compromise on a $2.85 minimum. This the representatives of the men refused.

A conference by the molders' executive board at Cincinnati followed, and at a meeting of the Cleveland molders Tuesday evening, March 11, Vice-President Valentine was present to give the decision reached. It was announced as follows: "We heartily indorse the stand taken by the Cleveland molders for a minimum wage of $3 a day. We believe that in case of a refusal of such demands a strike is justifiable, and will stand behind the Cleveland locals to the bitter end."

On Wednesday morning, March 12, the machinery molders in 11 Cleveland foundries went out on strike. There are about 450 of them. All the 11 firms are members of the Cleveland Foundrymen's Association and nine of them belong to the National Founders' Association. The famous Cleveland strike of 1900-1901 lasting from July to February involved the same shops, and in addition those of the Variety Iron Works Co., Otis Steel Co. and Lorain Foundry Co., which have been operated non-union since the strike.

Cleveland foundrymen also have before them a demand from the Core-Makers' Union for an advance from $2.50 for 10 hours work to $2.75 for nine hours. The men went out on Monday, but pending conference between their national president and Commissioner Penton, of the National Founders' Association, returned to work.

John R. Morgan Engineering & Construction Co.

The John R. Morgan Engineering & Construction Co., of Columbus, O., recently incorporated, will build at once a thoroughly modern plant of large capacity, in which will be manufactured cranes, elevating and conveying machinery and ore hoisting and handling machinery. It is expected the plant will be in operation in from six to nine months. A large tract has been bought at Broad street and the Big Four Railroad, Columbus. The machine shop will be 240x100 feet, the foundry 250x100 feet, and the structural and erecting shop 250x100 feet. All will be equipped with the latest tools, electrically driven. The company expects to be in position to handle the largest contract work. The officers, several of whom have been connected with Columbus and other engineering plants, are as follows: Edward Ackland, president; John R. Morgan, vice-president and general manager; Wm. G. Hildebran, assistant manager; Gilbert D. Preston, treasurer; Robert B. Bryson, secretary; Charles F. Neuwirth, engineer.

The foundry and pattern shop of the Novelty Iron Works, of Canton, O., was destroyed by fire this week, with a loss of $40,000.

A LATHE ATTACHMENT FOR RELIEVING THE TEETH OF CUTTERS.

It is intended that this device be attached to an engine lathe or similar machine tool for the purpose of relieving or backing down the teeth of formed cutters used in cutting the teeth of gears and in various milling operations. The object is the accomplishment of this purpose with facility and correctness, retaining the exact contour of the tooth in cross-section, so that in grinding back the face of the tooth in sharpening the cutter the original shape will be retained. Of the three illustrations, Fig. 1 represents a view of the front of the attachment which is partly in section; Fig. 2, a plan of the

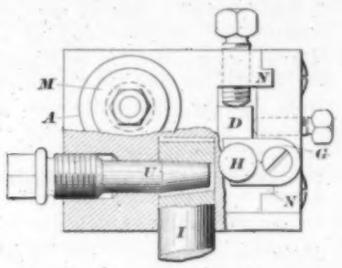


FIG. 1.—FRONT ELEVATION OF LATHE ATTACHMENT.

attachment with an arbor carrying a cutter to be sharpened and a template or form to guide the shaping tool; Fig. 3, a vertical section taken through Fig. 2, showing the arrangement for adjusting the tool and securing it in position.

The construction and operation are as follows: A is a block of cast iron which carries all the working parts of the attachment and is intended to be held on the slide-rest of a lathe in place of the ordinary tool-post. The block A has a horizontal groove planed in one side to receive the tool D, and a wedge that lies below the tool and the under side of the groove is made on an incline to the upper side so that the upper side of the wedge and the upper side of the groove will be parallel with each other. A milled-head screw H is fitted to screw through a bar G on the front end of the block and press against the outer end of the wedge (see Fig. 3) and push it in to raise the tool D and keep its cutting end on a level with the center of the cutter when it becomes necessary to grind off the top of the tool when sharpening it.

Two set screws are fitted to the upper side of the groove and press down on the tool D and hold it firmly when cutting. A cap is fitted with an upper and a lower rabbet NN in the block A (see Fig. 1) to cover the tool-slot, and two set screws passing through the cap hold the tool D against lateral pressure. The strain of the set screws on the cast metal over the slot is mainly transferred by means of the rabbets NN to the steel cap which is better able to stand it.

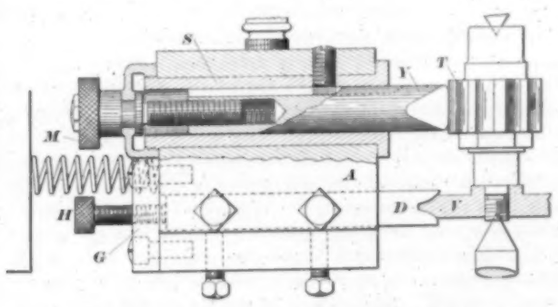


FIG. 2.—PLAN OF LATHE ATTACHMENT AND ARBOR.

A hole is bored horizontally through the block A to receive a sleeve S having a sliding follower Y, the inner end resting against the templet T secured on the arbor with the cutter V. A milled-head screw M is held by a cap attached to the front of the block A and fits into a groove in the body of the screw (see Fig. 2) and the screw is attached to the follower Y.

The block A is held on the lathe carriage Z by a stud I threaded to fit a nut O and slide in the T-slot usually occupied by the head on the lower end of the tool-post; the screw-collar O being intended only to adjust the length of the bolt to different depths of carriage slots.

The arbor on which the templet T and the cutter V are held is provided with a nut to set them, so that the recesses in the former will agree with the teeth on the latter. The cross-carriage of the slide-rest of the lathe is released from the feed-screw, so as to move freely back and forth across the lathe. The tool-post is then removed and the block A set in its place, the bolt and screw-collar O taking the place of the lower end of the tool-post. The collar O having been previously adjusted, the screw is turned in and the stud I drawn up by the taper portion of that screw, so as to hold the block A firmly in place on the slide-rest Z. The arbor with the cutter V and the templet T screwed to it (the two having been set on the arbor so that the teeth of the cutter and the templet will agree) is then put on the lathe-centers and held in the usual way. The follower Y and the tool D are then set, so that when the cutter D rests on the top of a cutter-tooth the end of the follower Y will rest on the top of a tooth of the templet T, and they are then secured firmly in the block by means of the set screws. The rest Z with block A are pressed in toward the arbor by a spring X or by a weight so as to hold the end of the follower Y against the templet or form T and move the follower in and out of the recesses, which motions are communicated to the block A and tool D and cause the tool to leave the teeth of the cutter in exactly the same shape as the profile of the templet.

The end of the tool D, which determines the shape of the cutter-teeth, is exactly the same in cross-section square to its face all the way from the upper side to the lower side, and

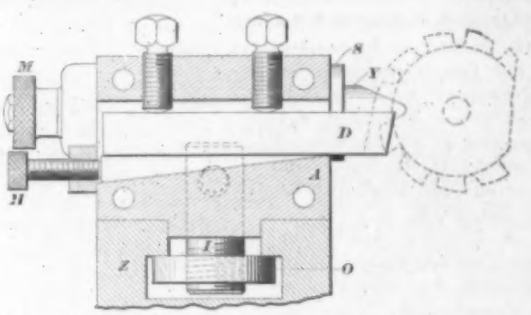


FIG 3.—VERTICAL SECTION THROUGH FIG 2

consequently has to be ground on top to sharpen it. When this is done, the tool D has to be raised to keep its cutting edge level with the center of the cutter, which is accomplished by means of the screw and wedge.

This attachment is the subject of a recent patent issued to F. Wesley Parker, of New York.

National Metal Trades Association.

The annual meeting of the National Metal Trades Association will be held at Cincinnati on Tuesday and Wednesday, April 8 and 9. The call has just gone out from the office of Secretary Olmstead, 95 Liberty street, New York. Matters of importance are to come up for consideration. The sessions will be held in the convention hall of the Grand Hotel.

The Rumsey Gas Engine Co., of Binghamton, N. Y., is removing its machinery to St. Johnsville, N. Y., where a new plant has been erected. The company has also been reincorporated under the name of the Rumsey-Williams Mfg. Co., with $75,000 capital.

At a meeting of the directors of the Dominion Steel & Iron Co. of Sydney, Cape Breton, held recently, it was decided to issue additional stock to the amount of $10,000,000 to provide for additions and improvements to be made to the steel plant. The whole of the amount has already been underwritten by Canadian banks and will be issued to the public as soon as the required privilege is obtained.

The third furnace of the Republic Iron & Steel Co. at Thomas, Ala., will be placed in operation shortly. This furnace has the same dimensions as the other two at this plant.

SUGGESTED AT THE SHOP.

BY F. O. REMAN.

The editorial in these columns quoting some peculiar assertions (from the periodical *Success,*) in regard to the machine tool business brings me to the task of gathering a few other references from various sources and of recent date. Some of these things are not easy to explain and in fact it is rather in the point of view that the items may be mysterious or mirth provoking; perhaps a little of both. It all depends on the perspective and in these days of development one is not lacking in courage, or something else, if convinced that certain things cannot be done. Every year so many things are done that the year before could not be done that it is not easy to set limits to possibilities. It is just this production of new processes that allows the heralding of schemes of all sorts and sizes. The *World's Fair Bulletin* of St. Louis contains, for example, the following paragraph in regard to the performances of a prospective exhibitor at the coming exposition. "His electrical aerial torpedo, made of red and yellow silk, and filled with hydrogen gas till it is as hard as a stone, to prevent deformation from air pressure, he regards as the greatest invention, the one susceptible of the most useful and important development. With it, he says, he has made a trip of 660 miles at an average speed of twelve miles an hour, employing what he calls a spontaneous combustion caloric engine that receives most of its power from the air that cools its cylinder and costs nothing. At present he is devising a new motor which will be known as the acetylene gas motor. It will be a rotary capable of 5,000 revolutions per minute."

* * * * *

It is not quite clear why the aforesaid inventor did not stick to the motor which cost so little or nothing to run. Such an economical outfit deserved encouragement, and the fact that acetylene as a rule does cost something might suggest to the ordinary mind a fair reason for further explanation why the change was made. Perhaps the motor which ran blithely on next to nothing was overloaded by being next to an awkward name. Most any self-respecting motor would kick at being known as a spontaneous combustion caloric engine. The new motor will have a shorter title but at that 5,000 turns is likely to jump the track. It must have been a tough proposition to make that trip of 660 miles and keep it quiet.

* * * * *

An Ohio paper says that one of the state Senators is preparing a bill for the especial benefit of inmates of penal institutions. "The measure will prohibit the erection or operation of a boiler foundry within fifty feet of such institution for the reason that the noise will disturb the inmates thereof." The Senator is at liberty to introduce another bill to move the penal institutions if this measure does not prove successful and if he can get out the work with less than the usual amount of nerve-racking noise by another enactment he may call the boiler shop any old name. By the way, boiler shops are more habitable places than of yore. The closing of rivets with pneumatic tools is much less unpleasant than the clumsy handicraft of earlier days. Not that the old-time work was ineffective by any means, for in its way and under the prevailing conditions the product was truly remarkable.

* * * * *

Some of the more recent improvements in metals have not yet struck my place, but I am keeping a close watch upon the announcements as they appear, and I notice a press dispatch from Chicago to the effect that two representatives of the Union Steel Co., of France, have arrived there and are saying things. They are said to claim that "their company possesses a secret process by which it can produce steel of the best quality and practically unbreakable at about half the cost of American made steel." This is tool steel, by the way, and I know of sundry occasions when the task of breaking up quite ordinary tool steel bars has not been such a soft snap. From the shop point of view this practically unbreakable tool steel will be improved when it can be practically broken as desired and at no other time. A Quincy, Ill., newspaper comes to hand with a glowing story of the first heat in a local furnace, and it would seem that the people out there have tumbled on to the trail of the Frenchmen and gone them one better. We are told that malleable iron is "pliable, but not breakable, and is not affected by frost." This must be truly discouraging to our transatlantic visitors who will now feel compelled to patch up that secret process so that tool steel can be made that will not freeze.

* * * * *

The *Citizen*, of Albuquerque, N. M., describes the plan of a local inventor for smoothing the bore of old brass cylinders. Thirteen small rollers can be adjusted in a cylinder by means of screws, and the machine "is moved back and forth by means of a handle, the rollers simply smoothing out the rough places of the brass without taking away any of the metal, and at the same time doing the work with mechanical exactness." Like a great many other improvements it depends upon the mechanical exactness required and the possibility of keeping the scheme within bounds. A cylinder can be smooth and true, then again it may be the one and not the other, which is equivalent to saying that the practical cylinder may not be theoretically cylindrical. Burnishing the surface of a piece of metal gives a nice finish, but when you want accuracy, the less burnishing the better. It is all in the requirements anyway.

* * * * *

The brace of promoters that struck Joliet the other day got the ear of a local paper, and we are told of the prospect of a big locomotive plant being erected in that city to employ not less than 500 men. The invention is "understood to be a new type that will revolutionize the building of modern locomotives. Instead of heating the water in the boilers direct from the tender, stations are to be placed along the line similar to the present water towers and coal chutes. In these stations the water is heated to a high degree, and the tender of the new boilers is filled with the water at intervals. Another patent contrivance evaporates the water in the boilers. It is claimed that this process will greatly reduce the cost of evaporation under the present system." The storage system as applied to air, steam or electricity, has been a favorite subject with inventors. It seems the easiest thing in the world to generate your power, box it up and turn it over to the shipping clerk; but, in reality, many of these plans have proved the well watered, condensed milk in the stock market. Steam storage for traction purposes is not broadly novel, to use the language of the patent office. A Mr. Prall, of New York, took out a stack of patents on this line some years ago and a big company was announced, but I have not heard of any further developments for a long time. The method of storing steam has been put in use abroad, however, and a detailed account of its application to street car propulsion in France is given by M. Farman in his work on the motor vehicle. An American engineer of wide reputation, Dr. R. H. Thurston, mentions the shortcomings of steam storage in his treatise on the boiler, but this is of no account to the average promoter.

* * * * *

This lopping off of the ordinary attachments to the steam engine is not an unusual form of inventional activity, and the effort of the one genius to get rid of the generator on the locomotive is purely elementary to the task described in a recent issue of the Toledo *Bee*. The writer of the article in that journal frankly confesses his inability to do justice in his "write up," and begs the indulgence of the reader's imagination after the following style: "Imagine a locomotive without a boiler, and after you have that clearly in your mind's eye, just imagine the same locomotive without a smokestack, and then without a load of coal tacked on behind, and finally without a firebox. The inventor of this wonderful contrivance calls it a trimotor. It is named that because it is a steam engine, gas engine and steam boiler combined into one, and as a motive power requires either oil, naphtha or gas, and in some cases petroleum may be used." The elated designer looks forward hopefully to the time when ocean vessels, street cars and railroads, will be blessed with the benign influence of his machine, and the *Bee* circulates his anticipations to the following effect: "Think of the millions and millions of dollars that will be saved by the steamboat companies as well as the railroad companies. The scope of this invention cannot be told in a few words." The newspaper account is not wholly satisfactory, but this may be no fault of the reporter, who has

added a suggestive paragraph to the effect that "there are yet a few little details to be completed, and then the model will be exhibited to the public for inspection."

* * * * *

There is a similarity about the work of truly great minds, and it is not surprising that the Patent Office *Gazette* for March 4, tells of a motive power apparatus that bears a striking resemblance to the stackless, boilerless and coalless locomotive. One of the claims runs as follows: "The combination of a motor of the steam-engine type, with means for mixing hot water and gases to produce expansive fluid to actuate the motor, a pump for drawing, compressing and igniting combustible mixtures and discharging the hot gases, a hydraulic pump operated from the motor to supply water to actuate the piston of the gas-pump and to supply the water for mixture with the hot gases." This may not be the scheme of the Toledo man, and for the general good it is hoped that he has something new.

* * * * *

The combination gas and steam engine, or even the boilerless steam motor, has had the attention of the designer hitherto and has usually been abandoned for various reasons. It is an alluring proposition to utilize the furnace-like interior of a gas engine cylinder for alternate operation by steam; the one process heating the cylinder so that it serves as a generator of steam and the other reducing the temperature of the metal to better working conditions. The scheme does not seem to have prospered in practice, however, and the stumbling block of the arrangement may lie in the inevitable complexity. Be this as it may, I trust the American at Toledo, or the German at Berlin, whose devices have been outlined here with all the care that their meagre references would permit, will not be discouraged at the "little details" in the path, but will take a fresh hold and get the respective machines into good marketable condition.

Foreign Engines for American Steel Mills.

Partly through the inability of engine builders in the United States to make desired deliveries, several orders for heavy-duty engines have been sent from this country to Europe recently. For an open-hearth plant to be erected in Cortland, N. Y., foreign-built engines have been ordered. It is stated also that the Grand Crossing Tack Co., Grand Crossing, Ill., has given an order for a reversing rolling mill engine to Ehrhardt & Lehmer, of Schleifmereble, near Saarbrücken, Germany. The engine will have a capacity of 5,000-h. p., and will be installed in the new open-hearth plant under way at Grand Crossing.

Dr. Wm. B. Phillips, director of the University of Texas Mineral Survey, Austin, Tex., has recently published Bulletin No. 2, a pamphlet of 43 reading pages, besides numerous full-page illustrations. It deals with "Sulphur, Oil and Quicksilver in Trans-Pecos Texas" and is a report of progress for 1901. Bulletin No. 1 dealt with Texas Petroleum and was issued about Sept. 1. Under Dr. Phillips' direction the literature of mineral developments in Texas is rapidly taking shape.

A company with a capital of $1,000,000 is about to be incorporated in London for the purpose of acquiring the British rights to manufacture the Locke sprocket link chain, which was introduced into the United Kingdom from the United States some two years ago by C. W. Burton, Griffiths & Co. of London, a concern handling American machinery. It is proposed to put up a plant in Birmingham. The initial equipment of the works will comprise eight machines, each having a capacity for turning out 2,000 feet of chain per day.

The Compania Fundidora de Fierro y Acero de Monterey (The Monterey Iron & Steel Foundry Co. of Monterey, Mex.) which will enlarge its plant, chiefly with a view to the manufacture of gasoline engines, has begun to place contracts for equipment. Manning, Maxwell & Moore, of 85-89 Liberty street, New York, have an order for three large punching and shearing machines, which are to be built by the Hilles & Jones Co. of Wilmington, Del. The same firm has obtained an order for three rail-drilling equipments, to be manufactured by the Newton Machine Tool Co. of Philadelphia.

THE CONSPIRACY LAW IN CONNECTION WITH STRIKES.

From the headquarters of the National Metal Trades Association, 95 Liberty street, New York, the following circular letter has been sent out recently to members of the association and other employers of labor:

"Your attention is directed to a bill which was ordered favorably reported to the United States Senate on Feb. 3 by the Committee on the Judiciary of that body, known as Senate Bill No. 1118, limiting the meaning of the word 'conspiracy,' and the use of 'restraining orders and injunctions.'

"The bill in question provides that 'no agreement, combination or contract by or between two or more persons to do or procure to be done or not to do or procure not to be done, any act in contemplation or furtherance of any trade dispute between employers and employes in the District of Columbia or in any Territory of the United States, or between employers and employes who may be engaged in trade or commerce between the several States, or between any Territory and another, or between any Territory or Territories and any State or States or the District of Columbia, or with foreign nations, or between the District of Columbia and any State or States or foreign nations, shall be deemed criminal, nor shall those engaged therein be indictable or otherwise punishable for the crime of conspiracy, if such act committed by one person would not be punishable as a crime, nor shall such agreement, combination, or contract be considered as in restraint of trade or commerce, nor shall any restraining order or injunction be issued with relation thereto.'

"It is well known to employers of labor that many acts, comparatively harmless if committed by individuals acting singly, become highly dangerous to property rights and the general welfare if committed pursuant to agreements or conspiracies by or between a number of persons, and it is this fact that renders such combinations unlawful. As an eminent jurist has said, 'such combinations are said to be unlawful conspiracies though the acts in themselves and considered singly, are innocent, when the acts are done with malice, i. e., with the intention to injure another without lawful excuse.'

"The law, as it now exists, renders criminal any conspiracies to prevent another from exercising a lawful trade or business by force, threats, intimidation or coercion; the proposed bill, if it becomes a law, will give free reign to the perpetration of acts that have heretofore been the subjects of legal restraint; it will render lawful, to the extent of the jurisdiction of Congress, boycotting, the picketing of struck plants and general interference with the proper carrying on of all branches of industry, and will have the effect of defeating all efforts of employers of labor to conduct their establishments in accordance with correct business principles.

"It is believed that the manufacturers and employers of labor throughout the United States should be warned of the action taken by the Senate Judiciary Committee. The bill is in line with the efforts of organized labor, and all must realize without argument the danger involved by the proposed legislation. We trust that manufacturers will see the need of associated action to protect themselves against the passage of laws of this character. It is sincerely hoped that you will take what steps you can to prevent the enactment of a law so calculated to injure trade and commerce, and suggest that you immediately write your Senators and Congressmen to defeat this unjust measure."

The Allis-Chalmers Co. of Chicago, Ill., has been awarded a contract for the construction of six additional engines of 12,000-h. p. capacity each by the New York Underground Railway Co. A similar contract was awarded this concern last October. Other contracts now on the books of the Allis-Chalmers Co. call for eight engines for the Manhattan Railway Co. of New York; eleven engines for the Metropolitan Railway of New York. These contracts together with a number of other large orders bring the total amount of business now on the company's books close to $5,000,000.

The plant of the Lima Steel Casting Co., Lima, O., which was destroyed by fire recently, will not be rebuilt. The insurance carried amounted to about $13,000, while the entire loss amounts to nearly $100,000.

NOTES ON THE BLAST FURNACE.

First Bell and Hopper in the United States.

BY JOHN M. HARTMAN.

In 1868 J. B. Moorhead & Co. of Conshohocken, Pa., applied the first bell and hopper at Merion furnace. The bosh was 12 feet and the stock line 9 feet 6 inches. The ores used were about one-fourth broken magnetite and the balance brown hematite, mostly fine wash ore. The furnace had just been overhauled and had applied to it two Player cast iron pipe stoves, the first used in this country. After blowing in the furnace worked irregularly. The bell and hopper were taken out and the furnace run open top.

The difficulty then arose to control the gas and get it down to the stoves on the ground. If the furnace drove well the gas coming off cool would descend and do well. As soon as the furnace worked hot on top the gas escaped into the air and was lost. The furnace being scaffolded was then blown out and a hole was found up through the center of the stock. The fine ore remained in the furnace, where it was dropped and then passed down the walls. The coarse ore, limestone and anthracite coal rolled to the center, while the fine ores pasted to the sides of the furnace, letting the blast pass up the center of the stock, which was more open and did not obstruct the flow of gas. Mr. Jefferies, the superintendent, put in a new hearth and bosh and then blew in without the bell. Finding he could not control the gas he reduced the bell to 4 feet, made a new lip ring and placing it in the furnace top had no further trouble.

If he could have had more blast to drive the furnace up to what is now used, the bell would have been the right size at 5 feet 6 inches, but the small volume of gas worked up through the center of the stock only, leaving the sides stand. The coarse anthracite and coarse ore with limestone in the centre, the fine wash ores on the sides and the small volume of blast all operated against distribution and good work. Player and Henderson were the engineers.

These stoves were patented by John Player of Norton, Eng., and also patented in this country. Mr. Player's assignees afterward brought suit against a number of our eastern furnacemen for infringement. His two points were:

"A combustion chamber in which the gas is received and consumed."

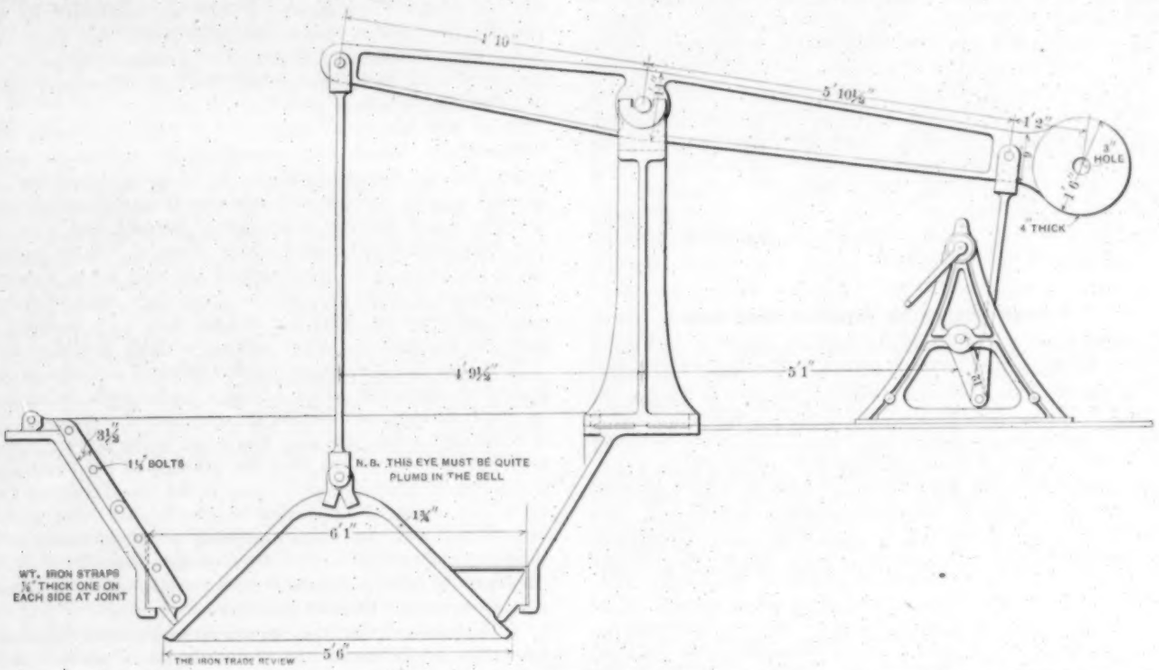
"A separate pipe chamber in which the products of combustion are received and expended in heating the pipe and obtaining a higher temperature."

As these stoves were the same in all respects as those built by David Thomas, Sr., at Catasauqua, Pa., in 1846, having a combustion chamber under the pipe chamber and universally used here, the furnacemen held a meeting at Reading, Pa. David Thomas, Sr., presided and George F. Baer was appointed attorney to contest the alleged infringement. Player assigned his patent to Sellers & Co., who finding the formidable opposition to them dropped the case.

The secret of the Player stove was that he increased the heating surface of the pipe to the cubic feet of air blown per minute. When our American furnacemen had built pipe stoves of what was then considered proper size and afterwards increased the air blown per minute, they had to resort to burning part of the gas in the pipe chamber to get the air hot, and in so doing the life of the pipe was shortened and frequent renewals were required. Prior to this time, 1868, the gas at the furnace top was collected in a ring flue built in the lining back of the inwall with slots through into the ring flue. The powerful chimneys of the stoves and boilers at the top of the furnace drew the gas through the flues into the stoves and boilers, and dampers were placed in the branch flues to control the gas. Air was admitted to burn gas through the holes in the walls at the end of stoves and boilers. If too much air was admitted a brick was stuck in some of the holes to cut off the air.

Player and Henderson dispensed with the ring flue at top and used a single flue direct from the furnace under the hopper and placed gas burners at the entrance of the gas to the stoves and boilers to control and burn it. This gas burner was of the Wasseralfingen type used at the Wasseralfingen furnace, Germany, and is an old invention. Equipped in this way, the superintendent had perfect control of his gas and burned it well. The bell and hopper are an old German invention.

Great care had to be exercised to prevent the back flow of gas from firing in the flues and exploding, when stopping the furnace. The bell was thrown out a number of times by these explosions. Lowering the bell before throwing off blast overcame these explosions. Mr. Payer died after about five years work in this country and left to his heirs an estate of over $70,000, all made in that time.

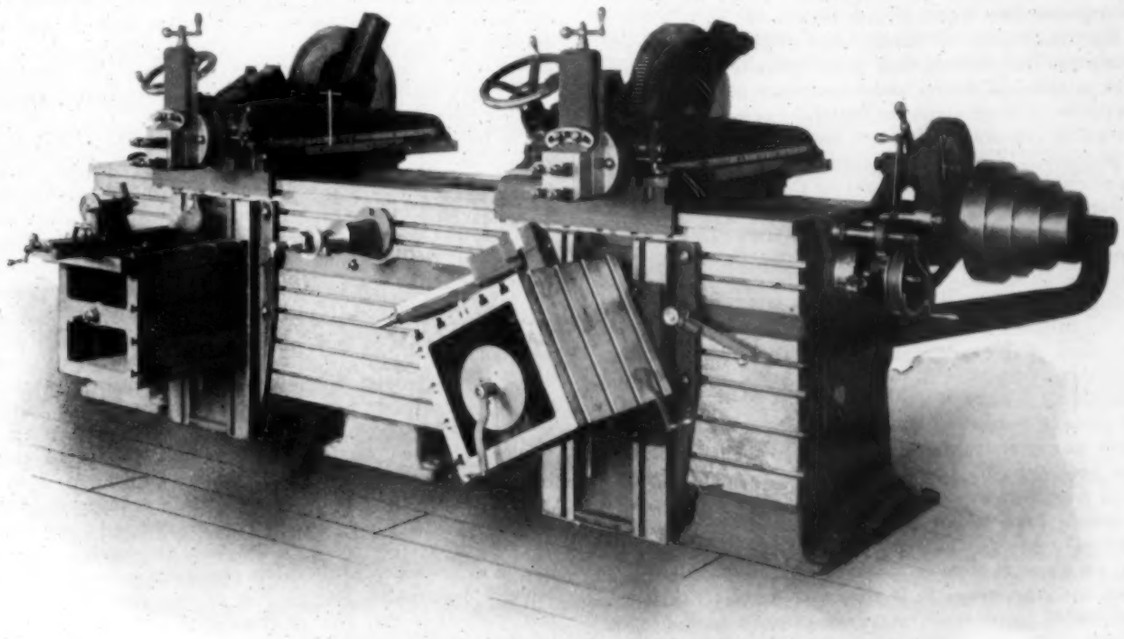


SECTION OF BELL, HOPPER AND BEAM FOR THE FURNACE OF MOORHEAD & CO., CONSHOHOCKEN, PA. DESIGNED BY PLAYER & HENDERSON, ENGINEERS, JULY, 1868.

At the annual meeting of the Curtis Sheet Steel & Corrugating Co. held at Zanesville, O., recently, the name of the company was changed to the Muskingum Valley Steel Co. The following board of directors was elected: L. T. Jack, W. L. Kirkland, W. S. Fiscus, James McMahon, W. L. Walker, Geo. S. Phillips and W. S. Horner. L. T. Jack was elected president; James McMahon, vice-president; W. L. Walker, secretary and treasurer, and W. E. Lloyd, manager. Goff, Horner & Co., Ltd., Pittsburg, will continue as sales agents of the company.

TWENTY-FOUR INCH CRANK TRAVERSE SHAPER.

The machine shown below, manufactured by the Cincinnati Shaper Co., Cincinnati, O., is designed for a class of work which cannot readily be done on a pillar shaper, as the head travels while the work remains stationary. The bed is wide and deep, and is strongly ribbed, making it very rigid. The face of the bed is provided with T-slots, and forms a true vertical surface, to which work may be directly secured. The aprons have a full bearing on the face of the bed, except where it is cut out by the T-slots, and where clearance is allowed for the rack and pinions provided for moving the aprons. The saddles, carrying the ram, have long and wide bearings, both on the bed and for the ram, and have taper gibs for taking up wear. They are operated by full length and separate screws; consequently the rams may be worked independently and with the saddles close together even at either extreme end of the bed. The rams being operated by Whitworth motion, have quick return, and their design gives great stiffness and ample wearing surfaces. They are also provided with a rack and pinion adjustment for length of stroke and position over the work. All traverse and down feeds are located on the saddle and head, and can be actuated by the workman while in position to see his work to the best advantage. All may be operated automatically or by hand and are a patented construction



A NEW TWENTY-FOUR INCH BACK-GEARED SHAPER.

permitting the direction and amount of feed to be changed while the machine is in motion. The heads are strong and substantial in construction with a simple and variable automatic down feed, also a worm for circular work.

The two tables are vertically adjustable on the aprons and horizontally along the bed. Each table is finished all over and has planed T-slots on three sides. One is plain and the other is arranged to swivel through an arc of 90 degrees, by means of a worm and worm-wheel. It has the degrees graduated on the plate at the front of the table. A circular mandrel is provided and by a simple arrangement is quickly connected to the saddle, so that the circular feed can be had either by power or hand. This mandrel is seen in position projecting from the center of the bed. On removing the circular mandrel, an opening 5 inches in diameter is obtained through the bed; through this shafting, etc., may be passed and keyseated at any point on its length.

The index centers furnished with the machine swing 13 inches. They are provided with five discs, accurately cut with 44, 52, 56, 90 and 96 notches respectively. The gearing is of wide face and large in diameter, giving strength and large wearing surfaces. The machine being back geared has, with the four-step cone pulleys, eight cutting speeds to the ram, sufficient for working all classes of metals.

THE PROPOSED FOUNDRY TRADE SCHOOL.*

BY THOS. D. WEST.

The drift of manufacturing into specialties has brought employers to feel very keenly the want of skilled artisans, and also is demonstrating the inability of workmen to comprehend and encourage real merit in the mechanic. These conditions are injurious in many ways to the advancement of labor, and to the welfare of the country; and there is urgent need of agencies that can assist in correcting these evil influences.

It is not that the manufacturer of specialties does not demand the best of a man as a true and skilled mechanic. Our specialty shops would be still better fitted to help sustain the supremacy of our country in everything pertaining to the betterment of mankind, by having thoroughly trained mechanics, competent to skillfully adapt themselves to the various lines of any one calling, rather than being capable of performing only one line of work. The knowledge that they can do but one certain thing in any line of manufacture discourages and kills the ambition of men, as well as a wholesome respect for their calling. Workmen of little or no ambition can never excel. This is a matter of everyday observation. Our country is suffering keenly from this lack of ambition in its working classes. This is growing worse day by day and some steps should be taken to check its progress.

We now have two factors which make it difficult to secure young men who will make the sacrifice of working for small wages in order to learn a trade. One lies in specialty manufacturers not affording opportunities for making broadly skilled mechanics, or at least such that can feel that they are not tied to experience in one line of some specialty only. Present inducements are not sufficient to prevent the majority of poor boys accepting laboring work which generally gives them double what they can earn as apprentices. In fact, some men can often secure higher wages at common laboring than they can by following some branch of specialty manufacture which they have learned. When young men see this, it requires strong inducements to encourage them to faithfully serve out an apprenticeship. The second factor lies in the mechanical lines of work not receiving the social recognition they deserve, and hence many young men seek clerical occupations in order that they may have cleaner hands and clothes, although they may receive far less wages. Let conditions be created whereby young men may know that they can learn to be so highly skilled in knowing how to do more than one thing so that they will be in demand at wages greatly in ad-

* Prepared for the American Foundrymen's Association.

vance of that they can secure at common labor, or in clerical occupations, and a far greater number would be desirous of giving up their younger years to learn a trade than is now the case.

The art of founding is suffering keenly from the antipathy of boys to learning the trade, and the degeneration of skill due largely to the same forces that are effective in other callings. To assist in remedying these evils, a foundry trade school has been proposed. It is intended that this trade school shall accept, among others, boys having graduated from the public, grammar or high school, who would bind themselves for three years and a half, as apprentices to learn the foundry trade in all its branches. This would embrace practice in green sand, dry sand, and loam molding, and the management of cupolas. The sole aim of the school would be to teach students all of the art of founding that is possible in the limited time. To do this, students would be advanced step by step as fast as they mastered the work assigned them. The policy of keeping a student on one job, after he had learned to do it well, so as to make the most money out of his labor, as in general practice, would not be allowed, as such a policy would be detrimental to the aims and interests of the school. Such a trade school should make much better mechanics than is possible under present conditions, and even with the best opportunities in outside shops, would give our country better workmen in three and a half years than would a six to seven years apprenticeship under present conditions.

In connection with the manual labor of learning the trade, it is intended that students shall devote three to four evenings a week to technical studies under competent teachers. These studies to be of direct use in the trade, and embracing mechanical drawing, chemical and physical metallurgy, business forms and practices. In addition to these studies, one evening a week would be devoted to lectures on the principles involved in the art of molding, mixing and melting irons, also in studying the different ways in which common as well as intricate castings can be molded. Illustrations of these would be taken from all sections of the country, so that when the apprentice graduated and commenced work elsewhere, he would find himself much more familiar with current practice in different parts of the country than apprentices are now in the best of shops. Such an apprenticeship with men of the right timber, would not only create most excellent mechanics, but could give our foundries a chance to secure much better foremen, or managers than are now generally obtainable.

The beneficial effects of this school in creating a higher class of mechanics would not only be that given to the young men coming from it, but its influence would set a pace for the general trade that could not be ignored, and hence, indirectly, aid shops at large in raising the standard of their mechanics and management. It is not so necessary that this school should be of great magnitude in order to benefit the country at large. The benefit inuring from the example it would set the trade, would be very helpful, and no matter how small the school began, much good would be done. In fact, such a school would necessarily have to be small at the start, and its growth would depend upon the management and the public support it received. This, there is every reason to believe, would be of a very favorable character. Such a school could also take over the standardizing work of our American Foundrymen's Association, and be helpful in other ways to the general trade.

The above suggestions indicate what a trade school could do to give the country better mechanics and citizens, for any person placed in a position whereby he can command a good living, as a rule, makes a better citizen than the one who cannot do so. Having shown what a trade school could do, it is next in order to suggest a way for the creation and maintenance of such a school.

This trade school should be located in a prominent iron center where plenty of land is available, close to some large concern which requires enough castings to employ a dozen or more molders, and as near a large city as practicable. Aside from making what local work the school might pick up, it should cater for a national trade in order to secure castings that would best illustrate the principles involved in the art of founding. The capital necessary should be raised by forming a non-assessable stock company so distributed that no individual should own a controlling interest. It would require from $75,000 to $100,000 to begin operations, a third of the money being held in reserve for working capital. The general foundry manager should have under him instructors of broad experience in molding, etc., in the special branches to which they would be assigned. These instructors would have charge of the advancement of the students, taking the lead in the actual work, until they can be entrusted with it alone. The last six months of the apprenticeship might be utilized by the student in serving as instructor to new apprentices, thus giving him a review of past work and also affording some experience as a manager, it being the policy of the school to give instruction in this field also. The benefit of this alone in giving young men correct business ideas of management would be great, as, at the present day, there are no means for young men to obtain this training.

The wages paid to students should be those ruling current in general practice. If a student secures this in connection with the special advantages of the school, it would be all that should be expected by him. One of the requirements of this school would be to so bind students, if accepted after a trial, that they would forfeit a certain percentage of their wages, should they leave the school before the completion of their course. It is generally hardest to keep apprentices through the last year, as they then think themselves capable of earning more money elsewhere. To guard against this, it is necessary for wages to be small on the start and as large as may be feasible the last year. This, in connection with the continued advantages of learning more than elsewhere, and forfeiting back wages, shall be sufficient to spur students that it is greatly to their interest to faithfully serve their time.

The only drawback that can now be perceived to making a success of such a school lies in the probability of not obtaining enough students who could support themselves during the first year, as it can be readily seen that this school could not afford to pay students sufficient wages the first year to make themselves self-sustaining. This brings us to the critical point, and shows the great need of some liberal endowment, placed in the hands of trustees, to be wisely expended in helping to defray the living expenses of students during their first year, and also to pay for the technical instruction.

Any philanthropist who would donate sufficient money to do this, and thus help worthy students to get a start in life, would do a staritable work, and in such original lines as to command for him the unstinted praise by all those interested in the uplifting of mankind. Some might think that such a school should be able to do all this without endowment. This school would have to go into the open market and compete for its work with other concerns, and with the disadvantages of having to pay big wages to obtain competent instructors in the foundry departments, and the loss of time necessary to educate students so that they could do work profitably, could not be expected that anything extra in the way of dividends could be secured to stockholders. Nevertheless, the institution should pay sufficiently well to induce individuals to risk something as stockholders in helping start and maintain such an institution, in consideration of the good it can do the trade and country at large. The donations and stock subscriptions are two distinct propositions. The former makes possible the elevation of poor boys, who must otherwise go through life, barely able to support themselves, to say nothing of being of any benefit to their fellow men; while the latter is a risk in business enterprise.

The necessity for a foundry trade school was discussed at the convention of the American Foundrymen's Association, at Buffalo, last June. The idea was thought so feasible, and the object such a worthy one, that a committee was appointed to proceed with the matter and make a report of progress at the next convention, which will convene in Boston, June 17-19, 1902. This committee consists of Thos. D. West, chairman, Sharpsville, Pa.; E. H. Putnam, Moline, Ill., and Richard Moldenke, New York. This committee will be glad to learn of those who think favorably of assisting in financing the project, as well as of philanthropists who would take pleasure in tendering a donation to the endowment. As there are but a few months before the first progress report will be made, the committee hopes that sufficient interest will be manifested to cause the coming convention to tender its hearty support to the commendable cause presented here for serious consideration.

A NEW AIR AND GAS COMPRESSOR.

Since the line pressure of all air compressor plants varies continually on account of the variation in work done by the different motors using the air, the discharge of air from the compressor takes place at a correspondingly varying point of the stroke, and unless the discharge valve mechanism is properly designed power is lost by early or late opening of the

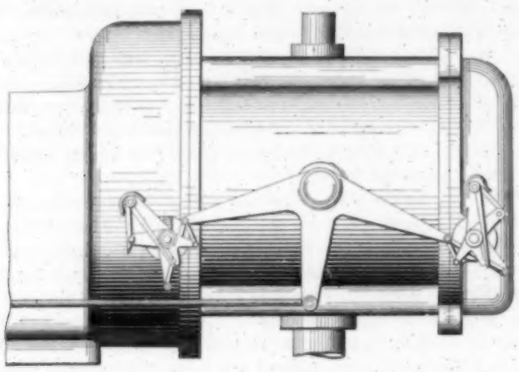


FIG. 1.—ELEVATION OF AIR CYLINDER AND WRIST-PLATE MECHANISM.

valves. Up to the present time no valve other than the poppet discharge valve has met these peculiar requirements in a satisfactory manner. In proof of this it may be stated that nearly all compressors of standard types are fitted with poppet discharge valves, while intake valves are of innumerable designs, automatic or positively operated.

While, however, the poppet discharge valve adjusts itself perfectly to variation in load the available space in the cylinder when using this type of valve is not sufficient to insure ample discharge area for high piston speeds without perceptibly increasing the pressure at the point of discharge, causing a loss of power. Its construction also prevents proper water jacketing, which tends to diminish the efficiency of compression.

In the compressor illustrated in Figs. 1, 2 and 3, the chief object of the designer has been a discharge valve that would be automatic in operation, open and close quickly at any part of the stroke and permit of ample discharge area for high piston speeds with minimum clearance loss. By means of the wrist plate mechanism this valve performs the function of an intake valve as well. The same valve opening is used for admission and discharge, thus further reducing the clearance loss and providing maximum cooling surface in the water jacket at the cylinder heads.

Fig. 1 is an elevation of air cylinder and wrist plate mech-

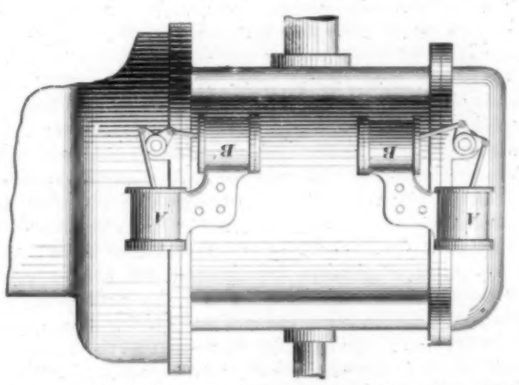


FIG. 2.—ELEVATION OF AIR CYLINDER AND VALVE-OPERATING DEVICE.

anism. Fig. 2 is an elevation of air cylinder from the side opposite to Fig. 1. Fig. 3 is a sectional elevation along the axis of the compression cylinder. A and B are small cylinders shown here fitted with plunger pistons connected to the valve stem.

Briefly described, the method of operation is as follows: At the beginning of the compression stroke the valve is positively closed by means of the wrist plate, and remains closed until the cylinder pressure slightly exceeds the receiver pressure, when it is opened wide by the slight excess of air pressure. The valve remains open to discharge until the piston has traveled to the end of its stroke or expelled all the air from the cylinder. At this point the difference in pressure between receiver and atmosphere, acting on the two smaller cylinders A and B, closes the valve to discharge and rotates it further to its intake position, where it remains until the end of the intake stroke. It is then quickly closed again by the wrist plate before compression begins. A communicates with the air receiver; B communicates with the inside of the compression cylinder by means of the opening C in Fig. 3. During the intake stroke the plunger pistons of A and B are in the position shown at the right in Fig. 2 (receiver pressure in A and atmospheric or intercooler pressure in B). The valve is shown open at the left side in Fig. 3 for corresponding position.

At the beginning of compression stroke the plunger pistons of A and B are moved just enough to close the valve. The corresponding position of the valve is seen on the right hand side of Fig. 3. As soon as the pressure in the compression cylinder (communicating through to the small cylinder B) is slightly in excess of the receiver pressure, it acts on piston of B so that the pistons of A and B balance each other as shown on the left side of Fig. 2. This instantly opens the valve to discharge, and it remains wide open until the piston has passed completely over the opening C. At this instant the air in the small cylinder B expands to atmospheric pressure through the opening C causing the plunger of A to drive back the plunger

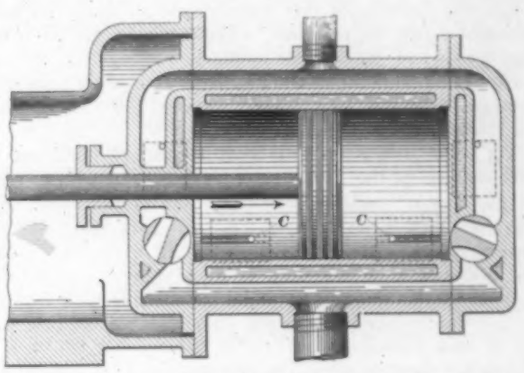


FIG. 3.—LONGITUDINAL SECTION THROUGH CENTER OF COMPRESSION CYLINDER.

of B very rapidly and noiselessly, B acting as a dash pot. The valve now remains open for the entire intake stroke and is again closed positively at the beginning of the next stroke. The compressor is the invention of F. C. Weber, Park Building, Pittsburg.

The Brown Corliss Engine Co., Milwaukee, Wis., has appointed Woolston & Brew, 39-41 Cortlandt street, New York, as its general Eastern agents.

At the Valley mills of the Republic Iron & Steel Co., at Youngstown, O., the puddlers went on a strike recently, owing to the poor quality of the slack furnished them and claimed that they were being discriminated against. A committee from the offices of the Amalgamated Association adjusted the matter, however, to the satisfaction of both sides and the men returned to work.

Ground has been broken for the erection of the new plant of the Atlantic Screw Works at Hartford, Conn. The building will be 204 feet long, 55 feet wide and two stories high.

The nut and bolt plant of the Youngstown Mfg. Co., Youngstown, O., was placed in operation last week. Considerable business has already been booked for all departments which will be in operation shortly. The company is capitalized at $300,000.

The four-mill sheet plant of the Ashland Steel Co., Ashland, Ky., was placed in operation last week.

SOME RECENT ENGINEERING OPERATIONS.

At the recent annual meeting of the Engineers' Society of Western Pennsylvania the retiring president, H. W. Fisher, presented interesting information embodied in letters answering inquiries he had addressed to government engineers and to the engineering departments of several important manufacturing concerns. The writers were asked to speak concerning new methods of manufacture, large or new types of machines, amounts of material used, and to give their opinion on what may be expected in the early part of the century in increased size or new types of machines.

Edwin Reynolds, chief engineer of the Allis-Chalmers Co., writing from the Milwaukee office, says:

"We may mention the following as some of the large installations which we have sent out during the last year, the ones selected being those which we think would be of most interest:

"Two engines of the three cylinder compound type, each of 2,500-k. w. capacity, for the city of Glasgow. It is interesting to know that in spite of the bitter opposition by the British press, the Glasgow authorities were exceedingly anxious, after the receipt of the first two, for us to send them two more. The order, however, was declined on account of time of delivery. We have sent one engine of 1,600-k. w. capacity, vertical compound, to Sydney, N. S. W., for the government tramways there. To southern Russia—two large steeple compound vertical blowing engines, each with two 87-inch air cylinders. A duplicate went to Birmingham, Eng. These engines are both of the standard type used extensively in the iron districts of this country, and of which we have furnished during the past year, in the Pittsburg district, in the neighborhood of 30, with air cylinders varying from 87 inch to 100 inch. These are distributed between Jones & Laughlins, Carnegie, Riverside Iron Works, National Steel Co. at Bellaire, Newcastle and Mingo Junction.

"For street railway lines the most notable order was one for eight engines for the Manhattan Elevated Railway Co. These are the double combined horizontal and vertical type, each with two high pressure cylinders 44 inches diameter, low pressure cylinders 88 inches diameter, all by 60-inch stroke. The horsepower at best load is 8,000, and a maximum of 12,000 per unit is guaranteed. This has recently been followed by an order for six more of the same type for the new subway of New York City.

"Another new departure is the Worcester blooming mill engine. This is similar to one-half of the Manhattan type engine. There is a horizontal and a vertical engine, each with a 44-inch x 60-inch cylinder, connected to the same crank pin. This leaves room for the valve gear at one side, and leaves one end of the shaft entirely free for direct connection to the rolls. It is pronounced by everyone who has seen it the most successful engine for this class of work that was ever built. We are building a second one which, however, will be compound, 44 inch x 78 inch x 60 inch, for the Carnegie people.

"As to prophecy in regard to size of engines, our experience seems to indicate that with 2,500-h p. to the cylinder, the limit for reciprocating engines has been pretty nearly reached. This gives 5,000-h. p. to the ordinary cross-compound engine, or 10,000-h. p. to the engines of the Manhattan type. It is doubtful whether this will be much exceeded, if it all. Regarding the new types, it is perhaps idle to prophesy. We are showing our faith in a continued demand for the Corliss type by spending something like $3,000,000 on a plant which will cover a good part of 100 acres of ground, to care for our present business in this line of work, and there is room and provision made for the extension which we believe will be required. This shows our faith that there will not be any immediate change, to say the least, in the type of engine used in our large industries."

W. A. Bole, superintendent, answers on behalf of the Westinghouse Machine Co.:

"We have built and erected during the past year three distinct types of very large steam engine units, all for the purpose of driving electric generators, and all of them located in Eastern cities of this country. One of these units is of the following description: The high pressure cylinder is 46 inches diameter, the low pressure cylinder 86 inches diameter, stroke 60 inches, revolutions 75 per minute. This engine is fitted with Corliss valve gear throughout, and operates to drive a 2,850-k. w. a. c. generator, running in multiple with other units in the same station as well as with engines in other substations of the same company at remote distances. I enclose herewith a small photograph showing this engine, in fair detail, which will enable you to comprehend something of its general character. The shaft of this engine is probably the largest specimen of its kind ever brought to Pittsburg, it was forged by the Bethlehem Steel Co., South Bethlehem, Pa., from a fluid-compressed, open-hearth steel ingot. Forging was done by hydraulic press, and the shaft was hollow forged, that is to say, the ingot was first bored out along axis, by a process which removes the unsound metal at the core or heart of the ingot; a mandrel was introduced into this hole after the ingot was heated, and the hydraulic press thus had to penetrate a reduced mass of metal.

"The forging of a shaft by this means is more dependable and more reliable than by the old method. The shaft was shipped rough-machined from Bethlehem to Pittsburg, and in our lathes we finished the machine work, making all the fits, cutting the keyseats, and making it ready to go into the engine. The flywheel of this engine is somewhat of a novelty, being made up of steel castings, as respects the arms and the rim; the hub sections were made of air furnace cast iron, having a strength some 50 per cent higher than ordinary cupola metal. The total weight of this immense wheel, which is 28 feet in diameter is 340,000 pounds. Its bore, that is to say, the diameter of the shaft where it fits, is 39 inches. The engine is provided with reheating receiver, in which the steam exhausted by the high pressure cylinder, and on its way to the low pressure, is first drained and then slightly superheated by passing through tubes surrounded by live steam. This engine runs regularly with condenser, and has developed as high as 6,000-horsepower per unit. We have two of these units now in active service in Brooklyn, N. Y. Total weight of this engine is about 1,100,000 pounds. The bedplates of each side weigh 86,000 pounds each.

"The second type of engine to which we have referred, is very similar to the first engine, except that in this case, the high-pressure cylinders are equipped with four poppet valves, instead of the Corliss valves. The motive in making this change in design was to permit the use of superheated steam, which is becoming more or less popular, and which has certain theoretical advantages favoring low steam consumption. The general style and appearance of the engine is otherwise very similar to that shown in the photograph. We are building and have almost completed the erection of two such units as this for a large elevated railway company in Boston.

"The third type of engine referred to is of quite different construction. This engine has three cylinders and three cranks, in fact it might be regarded as three separate engines set side by side on a common bedplate. The cranks are divided at irregular intervals, approximating, but not quite, 120 inches apart, so as to produce the most even turning movement, and the most regular speed of revolution. The high-pressure cylinder in this instance is 43½ inches diameter. The engine has two low-pressure cylinders, each 75½ inches diameter, placed on either side of the high-pressure cylinder, above referred to. The stroke of the three engines is 60 inches; revolutions, 75 per minute. This engine is equipped with poppet valves for its high-pressure cylinder, for the same reasons above mentioned, namely, superheated steam; while the low-pressure cylinders are equipped with Corliss valves, after the usual fashion. This engine is run condensing, with 175 pounds gage pressure, and has developed as high as 9,000 i. h. p. per unit. We have two such engines as this now in regular service, and six others exactly similar, in various stages of completion in our works and in the large power house. The power house in which these latter engines are located is at 38th and 39th sts., East River, New York City. We are, as you see, building among the largest steam engines ever attempted. The boiler pressures of today are enormously greater than they were a few years ago, and the present requirements call for greater strength of design, massiveness, and substantial construction. The weight of the last named engine is approximately 1,600,000 pounds per unit.

"As to whether larger engines will be employed in the near future, it is hard to say. Presumably the march of progress

will go on, and engines still more immense in size will be called for in the next decade. We are prepared to keep up with the procession, and are willing to build as large an engine as any other concern in the world can safely undertake. The use of a. c. generators, operating in multiple, has a tendency to incline designing engineers to very large unit sizes, so as to reduce the number of units which must run in multiple to the fewest possible.

"We are also building the very high speed engine known as the turbine engine. The past year has seen the installation of the largest steam turbine ever built for stationary purposes. This engine has developed as high as 3,000 h. p., runs at a speed of 1,200 r. p. m., and has attracted great attention among steam engineers during the past year. The engine is now in operation in the city of Hartford, Conn., and runs with superheated steam of high pressure, exhausting into vacuum. We are now at work on plans for turbine engine of double this size, or about 6,000-h. p. each, and we expect that this type of engine will find a great deal of favor in the next decade, owing to its great adaptability for multiple running. It has an absolutely uniform rate of speed during a revolution, and is, therefore, better adapted for multiple service than any other form of engine as yet developed. Its economy is of the highest, it requires less water, less room, less foundation, than any reciprocating engine of equal horsepower, and the generator for such engine, running at a high rate of speed employed in turbine construction, is but a fraction of the size of those generators where reciprocating engines must be employed for the driving.

"In the gas engine field, during the past year, we have made no very radical increase of size, but have built a large number of gas engines ranging in capacity from 300 b. h. p. each, down to 10-h. p. We are successfully operating gas engines as large as 650-h. p., and are now at work upon the construction of a type of double acting gas engine, which has been designed in sizes as large as 1,500-h. p. per unit. The blast furnace engineers of this country are looking with considerable interest towards the employment of such engines for driving machinery employed about the blast furnaces, which in large part consists of machinery for compressing the air for the blast. Such application is more or less in vogue in the older countries of Europe, and is receiving some close attention from our own company, as we have aspirations for this class of trade."

The following letter from the Southwark Foundry & Machine Co., Philadelphia, is by Jas. H. Maloney, secretary:

"Of the important work we have been doing during the past year, the following represents the more important installations: Eight vertical steeple cross compound blast furnace blowing engines with high pressure steam cylinder, 45 inches diameter, low pressure, 78 inches diameter, two air cylinders, each 78 inches diameter, all 60 inches stroke, weighing approximately 700,000 pounds each. These engines were for the new Carrie blast furnaces at Rankin, Pa., owned by the Carnegie Steel Co. They are designed for a maximum blast pressure of 30 pounds per square inch. Five engines of the same type were also installed by us at the D and E Furnaces of the Edgar Thomson Steel Works, owned by the same company. We also built for the Lebanon Furnaces of the Pennsylvania Steel Co., Lebanon, Pa., a second vertical quarter crank disconnected compound blowing engine, having installed the first one a year earlier, with steam cylinders 42 inches and 80 inches diameter, air cylinders 84 inches diameter by 60 inches stroke, and an engine of the same size and type for the Penn Iron & Coal Co., Canal Dover, O. These engines weigh about 900,000 pounds, and the unique feature of the design is that the steam and air cylinders are all on the same level, instead of the air cylinders being above the steam cylinders, as has been customary heretofore in vertical blowing engines. This makes a low engine with all parts easily accessible.

"In addition we have furnished for Bessemer steel works and blast furnaces throughout the country, a number of single vertical low pressure blowing engines to work in conjunction with existing high pressure engines disconnected, and also a number of horizontal quarter crank blowing engines, with air cylinders ranging from 60 inches x 60 inches to 84 inches x 60 inches. All of these engines have our positive inlet and automatic outlet gridiron air valves.

"We also furnished for the new works of the Union Steel Co., Donora, Pa., a horizontal double tamdem compound Porter-Allen engine, having two high pressure steam cylinders 38 inches diameter, two low pressure steam cylinders 75 inches diameter by 60 inches stroke, for transmitting power through a rope wheel 13 feet face, weighing 225,000 pounds, and also coupled direct by return crank on one side. The crank shaft for this engine weighed 125,000 pounds. The engine will develop about 9,000-h. p. maximum. We furnished this same company with two smaller cross compound engines, and engines for their electric power station.

"We furnished to the Colorado Fuel & Iron Co. a horizontal tandem compound Porter-Allen engine, 40 inches and 75 inches x 60 inches, which will couple direct to mill, and has a flywheel weighing 180,000 pounds, made in two pieces. We have also built this year a compound reversing engine for a slabbing mill, the first of its type produced in this country. It drives through steel gears with cut teeth, and mounted on end of bed plate. A pair of simple reversing engines are included with the outfit for driving the vertical rolls. This engine weighs 1,250,000 pounds. In addition we have done a large volume of business of ordinary character. We only refer above to the large examples."

The P. H. & F. M. Roots Co., Connersville, Ind., write:

"As far as our pumps are concerned, we have not fully developed them for the different purposes they will be used in the future and could only give you a limited amount of information in regard to them. We have a large pump installed at the sugar plantation of Schmidt & Zigler, New Orleans, which is used for drainage purposes. This pump is working under a head of from nine to ten feet, is handling about 35,000 gallons per minute, and is far more economical than a centrifugal pump, under the same head, handling the same quantity of water. Our pumps are positive in their action, just as a reciprocating pump is. They require no priming or foot valves.

"We are now building two pumps for the Jones & Laughlins Co., Pittsburg, to be used for handling circulating water for condensers. These pumps are to have a capacity of 20,000 gallons per minute. We are about ready to ship a pump to the Illinois Steel Co., So. Chicago, having capacity of 11,500 gallons per minute, and capable of working against a head of 150 pounds. In regard to gears on these pumps, they are made of what we call semi-steel—that is, of a first-class quality of Bessemer iron, with a mixture of steel to toughen it, and for 100 pounds, the gears we have on these machines will be amply heavy."

The American Bridge Co., Pittsburg division, gives data concerning its bridge-building operations:

"Probably the heaviest double track through truss span erected to date, is the span of the Union Railroad at Rankin, Pa., connecting the Carrie Furnaces with the Homestead Steel Works of the Carnegie Steel Co., which weighs 2,500 tons, and with a metal flooring for the hot metal track 300 tons additional, making total weight of 2,800 tons. This was completed during the year 1901. Our company also has a contract for the double track cantilever bridge over the Monongahela river for the entrance of the Wabash Railroad into Pittsburg. The channel span will be 860 feet and will require 14 inch eye-bars, with probably 36 inch heads, which are in excess of anything that has been manufactured in the past.

"One of the old time railroad bridges will be replaced the coming year, by a new structure, viz.—the bridge No. 1 over the Allegheny river for the P. Ft. W. & C. Ry. This structure will have two tracks on the upper deck and two on the lower, which makes it one of special design. Another one of the old time bridges which will be displaced, will be the bridge for the P. C. C. & St. L. over the Monongahela river at Pittsburg, which has cast iron end posts and top chord, which will be replaced by the new modern steel structure."

For the Carnegie Steel Co. John McLeod, assistant to the president, writes as follows:

"Last year the Carnegie Steel Co. produced 2,300,000 tons of pig iron; 3,500,000 tons of steel ingots, and about 2¼ million rails in number, aggregating about 700,000 tons. Two notable improvements in steel manufacture are the Kennedy-Morrison process for rolling rails, copy of which we enclose herewith, and the Monell open-hearth process, an account of which you will find on page 13 of *The Iron Trade Review* of May 31, 1900.

"The world's blast furnace record was broken twice in the past year; once by a new stack at Carrie Furnaces with 790 tons of iron produced in 24 hours, and later by one of the National Steel Co. stacks at Youngstown, producing 806 tons in 24 hours."

From the Baldwin Locomotive Works, Philadelphia, the following information was given:

"For the year 1900, 1,217 locomotives were constructed; during the first six months of 1901, 640 locomotives were built; since July, 1901, and at the present time, the construction is at the rate of 1,500 locomotives per annum. We consider the Atlantic type of locomotives for fast passenger service one of the most notable types of recent construction. Many of this type have been built during the present year. The type was originated by the Baldwin Locomotive Works in 1895, and has proved itself eminently adapted to the service for which it was designed. Various roads have adopted it under another name, but still retain the broad principle of the Atlantic type. It has also been reproduced on foreign roads.

"The heaviest locomotives in the experience of these works were built for the Lehigh Valley Railroad, to operate on the mountain grades near Wilkesbarre. They are of the consolidation type, with compound cylinders of the Vauclain four-cylinder compound system, and are equipped with Wootten boilers. The boilers have 4,100 square feet of heating surface, and the locomotives weigh, in working order, 225,000 pounds, exclusive of the tender, 202,000 pounds of the weight being on the driving wheels and utilized for adhesion. The locomotives were guaranteed to haul 1,000 net tons, exclusive of the weight of the engine and tender, up a grade of 66 feet in a mile, at a speed of 7 miles per hour.

"With regard to the size of the locomotive which may be expected in the future we will say that for all existing classes the weights have doubled in the past 25 or 30 years. The average weight will undoubtedly further increase in the near future, and in some cases by increasing the number of driving wheels a greater total weight may be obtained in individual cases. The maximum weight per axle for a 100 pound rail seems already to have been established and utilized in many instances. It is therefore doubtful if axle loads exceeding 55,000 pounds will be used for some time to come."

H. K. Porter & Co., of Pittsburg, manufacturers of light locomotives, say:

"Our special work has been the design and construction of all types, sizes and gauges of locomotives for the lighter class of general railroad and industrial work, and we have confined ourselves to the building of locomotives having cylinders not to exceed in diameter and stroke 17x24 inches, and the greater part of our product is the class of locomotives with cylinders averaging between 6 and 14 inches. It would be difficult for us to specialize our work in any way, inasmuch as we have had a very large demand for types of light locomotives very different in general appearance and construction, dependent entirely upon the work that they had to do. For instance, we believe that we have especially achieved signal success in the construction of narrow gauge locomotives for the heavy class of steel works service. We have also had to meet an increasing and very extensive demand for a 3-foot gauge type of locomotive, weighing about 12 tons, cylinders 9x14 inches, specially adapted to the use of contractors who have been responsible for the actual work entailed in the new construction of so many miles of our railroads throughout the country. There seems to be a growing field for the use of light locomotives not only in the United States, but abroad; and we often find ourselves in a position where we have under construction on our erecting floor possibly twenty to twenty-five different types of machines, in regard to general design, gauge, etc., and all being hurried to completion at the same time.

"In the last ten years we have embarked in the construction and design of pneumatic locomotives for underground and surface haulage, and we have developed an increasing and special demand for this type of machine; and today we have these locomotives in very general use throughout the United States. They are used very generally for underground haulage in the anthracite and bituminous mine districts of Pennsylvania, also they have been introduced in the copper and ore districts for underground haulage, as well as for surface haulage.

"We have just completed a large plant for the Anaconda Copper Mining Co., of Anaconda, Montana, for handling surface cars exclusively throughout their entire plant, which includes stamping mills, etc., etc. We have also completed two very important installations for the United States Government, storing up air at 1,000 pounds pressure and operating locomotives having 12x16 inch cylinders and weighing complete in working order 22 tons."

FOUNDRY ECONOMY.*

BY RICHARD MOLDENKE, NEW YORK.

The rapidity with which the buying of pig iron, on chemical specification, has spread among the foundries of this country, is perhaps the best evidence of the value of a rational method of procedure. Where at first the broker declined to sell iron under this arrangement, or exacted an extra 50 cents per ton, (one furnace even thinking a guaranteed analysis worth two dollars a ton above the market price), today the makers of foundry pig iron are almost altogether relieved from the annoying "fracture correspondence." That this revolution in practice has been no easy thing to accomplish may readily be imagined, and even today the majority of founders feel a little shy of irons with the proper composition which do not show the accustomed fracture.

With the selling prices of casting finding lower levels at every period of depression, the founder naturally asks himself: "How will I keep my margin of profit unchanged? I have been as economical as possible in every way, and yet other founders, whose tonnage is no larger, are quoting lower figures and seem to be making money." The solution is not so simple, and will be found based on a good cost system in the office, and scientific methods applied where needed in the shop. Just how the foundryman is to go about this work will form the substance of this paper.

Were it simply the question of employing an expert, the foundry doing a large business would soon be going in the right direction; but experts who have been through the changes of the last decade, and know what is wanted, are scarce. Technical graduates and others who can carry out the scientific manipulations required in a laboratory must be given a few years to acquire practical foundry experiences before they become valuable. The owner of a small foundry, therefore, finds it difficult to take advantage of those economies which great institutions have developed after years of pioneer work in their respective lines. The founder must do a little studying himself, of cause and effect in his foundry. He must so systematize his operations that should he not have a metallurgist on his staff, he need call in one only on occasion of troubles which require quick adjustment.

The most important consideration is naturally the daily product. This must be kept up to standard, and at the same time be as low in cost as possible. Here is where the cost accounts come in. One must know the cost per pound of the good castings sold for every department in the establishment. Thus if the cost of core-making runs say .25 cents per pound in one month, and it creeps up gradually to .35 cents in the course of the next three, it is time to see if the knife cannot be applied effectively, or failing this, to re-arrange or place new machinery to get the work out to better advantage. On the whole it will pay to do the latter anyhow, for until the monthly figures are not brought down to a point where there will be only a fluctuation of a few points, the department cannot be said to be in proper working order. Be it understood that this refers to a fairly uniform run of work. The principle involved, however, is a truly scientific one and should be applied in every manufacturing establishment.

The molding machine question will be found the most important one so far as the foundry pay-roll is concerned. A well-managed pattern shop and pattern storage system are also money savers. If the founder is personally systematic in his work, he will not tolerate slip-shod habits in his employes; if he is not inclined that way, it were better for

* Read before the February meeting of the New England Foundrymen's Association, at Boston.

him to get an associate who is systematic. Then should come the establishment of systems of working marked by extreme simplicity and carried through with an iron hand, the head of the establishment setting the example.

The iron itself will naturally give the founder food for continuous thought, as it is a constantly changing factor. To effect the greatest saving in the cupola room, one must know what is there, what to buy, and how the material is handled. Take first the pig irons. They will either be piled up by car loads, or stacked together by brands and with grade numbers. Thus we will see a separate pile for Low Moor No. 2 soft, Sloss No. 2 plain, Isabella No. 1 X, Pioneer No. 4, and the softeners.

Today the progressive foundry also has a number of piles. They are still separated by brands as formerly, this serving the purpose of locating any undesirable qualities shown by castings of an otherwise satisfactory composition. This statement requires further explanation. It is well known in the foundry trade that some irons are stronger than others, even where an analysis shows them to be of an identical chemical composition. This difference is most noticeable in irons of the lower silicon ranges, and in the case of charcoal and coke irons of the same cross-section. Among the charcoal irons we find that a cold blast metal is stronger than one made with warm blast, even if the former has more impurities. I have always contended that this lay in the manner of running the blast furnace, in so far as it affects the oxidation of the resulting pig iron. A furnace which charges pure stock and runs normal should make strong iron. The forcing of the operation, however, coupled with the addition of quantities of mill cinder and salamanders of burnt iron which can have no chance for proper reduction before they are melted and in the bottom, can only yield an inferior product for remelting in the foundry, no matter how valuable it may be in the making of open-hearth steel.

Since we are not yet able to trace the degree of oxidation of an iron by chemical means with any certainty, it must be looked for in another way. The American Foundrymen's Association, which, through its active members has done so much to bring about the adoption of rational methods of buying and using foundry irons, will, it is hoped, in the near future develop the best methods of judging strong and weak pig irons of given compositions, so that the founder may prove to his own satisfaction whether he is getting the proper returns for his money.

As was stated above—by keeping the brands of iron distinct, inferior varieties are soon located by cutting out the suspected ones from the mixture, and noting results. The piles are now arranged according to their silicon contents, due regard being paid to the other constituents as a matter of course. Thus, in the jobbing foundry, with sulphur and phosphorus normal in a given line of shipments, there would be one pile for 1.75 per cent silicon, one for 2.00 per cent, another for 2.25 per cent, and finally one for 2.50 per cent, or four piles. If there were three brands kept in stock in all the varieties, the number of piles would be twelve. If experience indicated poor results with the low silicon ranges of any particular iron, these would be omitted in making the next contract. For light work there would be extra piles for 2.75 per cent, 3.00 per cent, and even 3.25 per cent silicon, and special piles also for high phosphorus metals. Occasional bargains in high sulphur pig irons suitable for floor plates would also come in for this method of piling.

A letter of the alphabet painted conspicuously on each pile, and a stock book for continuous record will give the foundry superintendent the information wanted at a glance when making out his requisitions. This also conceals the identity of the iron so far as unauthorized persons are concerned, all the more so if the letters are changed about as the piles run out.

The ferro silicons and silico-spiegels being only used in small quantities, and that only in emergencies, usually find a convenient resting place a little out of the way of the stock irons.

The scrap heap will form the next consideration. Two general classes must be reckoned with. That which we make and that which we buy or take in exchange for good castings. As will be shown later, it is necessary for the founder to know almost daily how his product is coming out, in order that he may keep his mixtures in proper shape. This information, consisting practically only of the silicon and occasionally the sulphur in the castings made, also answers for the domestic scrap. It is also possible to keep the low phosphorus scrap for low phosphorus mixtures.

With the bought, or as we call it, "foreign" scrap, things are a little different. As it is manifestly impossible to attempt a reliable sampling of this material in order to find out what it contains, we must do a little guessing on this point, and then use no more than the mixture can safely stand without upsetting our calculations. Fortunately certain lines of castings require irons of a pretty generally understood composition. A piece of stove plate scrap, whether of recent date, or made 50 years ago, may be safely counted on as containing 2.75 per cent silicon, and 1.00 per cent phosphorus. Ordinary machinery scrap is never far from 2.00 per cent. silicon, with phosphorus and sulphur normal. Heavy machinery may be classed as 1.75 per cent silicon, and if it should contain more, so much the better. Scrap rolls, plates, car wheels, malleable scrap; in fact, everything out of the ordinary line of foundry work should not be used in quantity unless an expert is at hand to see that it is properly cared for in the mixture.

The founder, then, who wishes to make up his mixture from day to day by more accurate methods than the cut and try, will first settle upon the proportion of pig iron and scrap the necessities of the case compel him to use. He must take care of his own scrap in the first instance, and then look over the market prices of pig iron and scrap for the rest of his mixture; always remembering that the class of work he makes must not be injured by too great a cheapening of his melt. Cases may occur in which no foreign scrap is admissible at all, and you own, and a lot of steel in addition will only just let you out on the specifications. Unless you are running a sash weight factory 60 per cent of scrap, your own included, is about all you can safely stand. 25 to 40 per cent is a good average. It was my misfortune, through delays in shipment, to be left without any pig iron of the kinds I could use, in the yard for the period of four days, and 50 tons of castings had to be delivered daily under contract. A mixture consisting of 97 per cent scrap, most of it foreign, and 3 per cent silico-spiegel, containing 24 per cent manganese and 18 per cent silicon, answered all the requirements of the case, and nearly cleaned out the scrap pile. This is quoted not as an example to follow, but merely to show that a little science was a handy thing around the foundry just then.

For the purposes of the mixture calculation, suppose you prefer 70 per cent of pig iron, 15 per cent of your own scrap, and 15 per cent of foreign scrap. The size of the charge which experience has shown to be the most economical with your cupola is 5,000 lbs. You may use five charges one day and seven another. Of this 5,000 lbs., 3,500 will be pig iron, 750 lbs. your own scrap, and 750 lbs. foreign scrap. Experience has further taught you that the class of castings you make should average 2.10 per cent in silicon. This means 2.35 in the mixture, as about 0.25 per cent is burned out. Your scrap running 2.10 per cent silicon, and the foreign 2.00 per cent we have the following:

Domestic scrap—750 lbs.	Silicon 2.10% gives total silicon 15.7 lbs.
Foreign scrap—750 lbs.	Silicon 2.00% gives total silicon 15.0 lbs.

Or 30.7 lbs. of silicon of the 5,000 times 2.35 per cent, or 117.5 lbs. silicon wanted in the charge. This leaves 86.8 lbs. to be furnished by the 3,500 lbs. of the pig iron to be used. Now, in buying pig iron, it is always best to get the stock so proportioned that the greatest quantity on hand is that used to counterbalance the scrap put in. In the case under discussion, which is really that of the ordinary jobbing foundry, irons running 2.50 per cent in silicon are the ones required in greatest quantity, only smaller stocks of 2.00 per cent, 2.25 per cent, and 2.75 per cent being necessary. Let us therefore take 2,000 lbs. of say "Sloss" with 2.50 per cent silicon. This means 50 lbs. of the 86.8 accounted for. 1,500 lbs. must now furnish the remaining 36.8 lbs. silicon, or the iron would have to run 2.40 per cent silicon. As we do not have this in the yard, we can either reduce the Sloss a little and make up with iron running 2.75 per cent from the stock, or we may split up the remaining 1,500 lbs. into 1,000 lbs. at 2.75 per cent, and 500 lbs. at 2.25 per cent silicon from the yard. Do-

ing the latter, as it gives us three brands of iron in the mixture instead of two, we have:

Domestic scrap,	750 lbs.	at 2.10%	Silicon,	gives	15.7	lbs.	silicon.
Foreign scrap,	750 "	at 2.00%	"	"	15.0	"	"
Sloss,	2000 "	at 2.50%	"	"	50.0	"	"
Low Moor,	1000 "	at 2.75%	"	"	27.5	"	"
Mabel,	500 "	at 2.25%	"	"	6.2	"	"
	5000 lbs.			with	114.4	lbs.	silicon.

The mixture would therefore have 2.28 per cent, which is near enough to 2.35 per cent to pass. It is probably the simplest way to get it out. You can calculate it in your office in a few minutes, and be certain that the castings will come out right, if the mixture is properly handled and your materials are good.

Now, what is needed to make this work on mixture-making successful? Simply a knowledge of what is in your pig iron, and what is in your own scrap. Even this can be narrowed down to the silicon in both items for the daily run of work. I will go even further and say that two or three determinations of silicon a week, together with stocks of irons, well sampled and analysed as they are bought, and an occasional sulphur determination of your coke, is all that the jobbing or stove founder requires. I know cases where this work amounts to less than six dollars a week, or not even the wages of a laborer. I feel quite certain that many a young chemist would be glad to locate in a foundry centre if he can get that much from three or four foundries to begin with.

The above is naturally based upon the supposition that you, your sons, or your managers will do the thinking, the chemist only the manual work. Where you have enough thinking to do in this line to afford a good man in your works, get him, and your foundry foreman will thank you for relieving him from the responsibility and sleepless nights occasioned him by the changing of irons.

The application of rational methods in a foundry must be systematic to bring about the desired economy. It will not do to get an analysis of a chip of iron, pay ten dollars for it, and expect that your mixture will cost you two-tenths of a cent per pound less laid on the charging platform. I read of a man recently who did this and then asked the foundry world at large what to do with his ten dollar analysis—his gold brick. If he quietly sits down and thinks over what has been outlined above, he will see the necessity for going at the problem slowly, carefully, and once the idea is absorbed, working it out systematically. He will then wonder at the extreme simplicity of science applied in every day foundry practice.

Now comes an altogether different line of economy. How about your cupola house? Is your cupola tender really a man who will take pains with his work, or does he make a mystery of his job, keep the foreman at a distance, want only such and such irons, and go home when told to distribute his charges better? Have you still men with you who shovel in the material in a general mixture without separating into charges? I saw this done the other day and wondered what the castings would be like. Go among the molders a little and get their views on the iron tapped out and ten chances to one you will find the troubles coming from the charging platform. I had a cupola tender one day put on his coat and go home during a heat, and telling the men he would be sent for in the morning. I asked an intelligent laborer to jump in and better his prospects in life. My foreman and I staid with him until he became proficient according to our standard of measurement. The result was better iron, no chances taken with the cupola and the charges, and the latter weighed correctly. Today that laborer is getting three dollars a day. The moral is: Go up and watch your men weigh out and charge, watch them daub cupola and ladles, make bottom, and see if things are done with precision and judgment. Here is a chance for foundry economy as shown by hot iron of uniform composition and gotten out in quick time.

I mentioned chemical specifications for pig iron several times. This is simple enough. We deal with silicon, sulphur, phosphorus, manganese and total carbon, important in the order named. The limits of these elements in foundry work are now generally known, and so we simply specify like this: For ordinary medium weight machinery castings, silicon 2.50 per cent. This does not mean 2.00 per cent to 3.00 per cent, or even 2.25 per cent to 2.75 per cent, but nothing wider than 2.40 per cent to 2.60 per cent silicon. Make an agreement that everything between 2.25 per cent and 2.40 per cent takes the 2.25 per cent price, and you will have no difficulty in getting what you want.

To resume:—Manganese is specified to be not over 0.80 per cent, unless special reasons require an extension of this limit. Similarly phosphorus not over 0.80 per cent. Sulphur should not exceed 0.05 per cent, and if very soft castings are wanted total carbon may be required not under 3.75 per cent.

With the purchase of pig iron under chemical specifications, a good method of making mixtures which can be depended upon to produce the results desired, and the proper disposition of the charges in the cupola, the good that science can do the founder is accomplished in the main. There are of course many points which a well managed laboratory can place on an economical footing, especially when we turn to furnace irons, and special lines of castings. For the owner of a foundry which turns out say ten tons of castings every other day, it would, however, be unwise to establish this department as an adjunct to his works. He does better by sending his work out and learns all he can to apply the reports he gets properly.

Let it be understood that a good mixture mismanaged will give poor castings, but a poor one cannot under any circumstances turn out good work. The sole object of all this scientific manipulation is to start you off right, and then you must follow it up with due vigilance through every department of your work.

CINCINNATI MACHINERY MARKET.

CINCINNATI, March 10.—The machinery market for the past two weeks has been rather quiet and uneventful. There is, however, a good general demand and some of the larger concerns report that they are full of business for the first half of the year. There seems to be a demand from a variety of sources and several concerns report that they are shipping some large machinery abroad. Orders have been placed during the past week for a considerable amount of machinery for export—that is, considerable as compared with what has been going for some months. It is evident that tools can be furnished much more readily now than they could the latter part of last year and deliveries are not so bad. There is no trouble in getting workmen and the machine tool men are saved the difficulty in this regard with which they were confronted some time ago. Some factories are running two and even three shifts of men, and some are compelled to farm out some of their business with concerns that do not happen to be so full of business.

The firm of Dreses, Mueller & Co. has been dissolved, Oscar W. Mueller having sold out his interest to Henry Dreses and the Buckeye Foundry Co., the other two equal owners in the property. The business will be carried on without change and for the time being, at least, the firm name will remain the same. Mr. Dreses reports a good domestic business and also a fair demand for tools from abroad. The firm has just made a shipment of radial drills, its specialty, to Sweden, London and Russia, four large machines in all.

The American Tool Works Co. will make some extensive improvements in the building it occupies on Eggleston avenue. The front will be torn out and the interior largely remodeled with a view to getting more room and light and the offices will be removed to a building on the other side of the street. Bids will be received by the Cincinnati Planer Co. this week for building an addition to the large plant of the company on Buck street.

A number of Cincinnati machine tool manufacturers have furnished portions of the equipment for the Japanese government arsenal now under construction at Maizura. The contracts were closed for the most part through the Japanese house of Takata & Co., whose New York address is 10 Wall street. The American Tool Works Co. will furnish seven of its specialties, comprising drill press, radial drill, iron planer, and engine and gap lathes, the latter fitted with compound rests. The Lodge & Shipley Machine Tool Co. will supply a large engine lathe, with compound rest. The Bradford Machine Tool Co. will ship four of its lathes. The J. A. Fay & Eagan Co. is to build five machines, consisting of pattern maker, lathe, surface planer, band sawing machine and a mortising and boring tool.

SPECIAL CARS FOR METALLURGICAL WORKS.

Car construction is one of the special lines of manufacture carried on by M. H. Treadwell & Co., 95-97 Liberty street, New York, at their works in Lebanon, Pa. Four types of these cars which are designed for service at blast furnace, steel works or foundry are shown in the accompanying illustrations, which are merely representative, the company design-

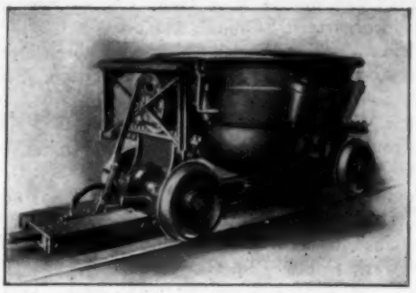


FIG. 1.—SLAG CAR.

ing and submitting plans on suggestions furnished for the handling of all furnace materials.

Fig. 1 represents a slag car, consisting of a truck and bowl. It is of standard gauge, and its capacity is six tons. The compact and convenient arrangement of the tilting and locking device is a noteworthy feature. The car is built for the con-

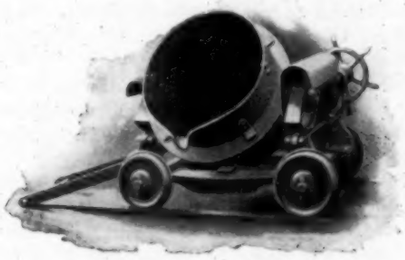


FIG. 2.—FOUNDRY LADLE CAR.

veying of slag at iron blast furnace, and is also employed at a number of smelting plants in Mexico. In Fig. 2 is illustrated the Treadwell company's foundry ladle car. The gear which revolves the ladle is complete and locks the latter in any position. The height of the ladle over all is 32 inches,

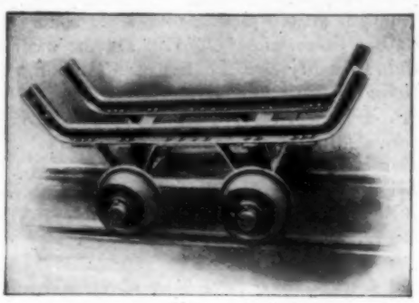


FIG. 3.—PIG IRON AND BILLET TRUCK.

and its capacity is 3,000 pounds of molten metal. The spout of the ladle when tipped clears the rail by 10 inches. The truck in Fig. 3 was designed for handling pig iron, pig lead, billets, shapes and other material in short lengths.

The hot metal car in Fig. 4 is of massive construction, the heavy side frame being a steel casting. The refractory-lined ladle is carried low and the gearing is such as to permit of the ready control of large masses of hot metal. The car is built for heavy and continuous service in the charging of cupolas, converters, open-hearth furnaces and pig casting machines, and for the transfer of molten metal in ladles for the direct process. It is of standard gauge, and has a capacity of 15 tons. Cars of this design have revolutionized the transportation of materials at steel works and furnaces.

THE CLERGUE BY-PRODUCT CHARCOAL PLANT.

Ernest A. Sjostedt, chief metallurgist of the Lake Superior Power Co., gives the following description in the *Engineering News* of the by-product charcoal plant now under construction at Sault Ste. Marie, Ont., near the steel plant of the Algoma Steel Co., an affiliated Clergue enterprise:

The charcoal plant will carbonize the wood by two different methods; namely, that in beehive kilns and that in steel retorts, both with the recovery of the by-products.

The retort plant will consist of 20 oven retorts, of 8 cords capacity, each 46 feet long, 6 feet 3 inches wide and 8 feet 4 inches high. The retorts are set between brick walls in a way similar to the setting of a steam boiler. A track of standard gauge runs through each retort. The wood, placed on iron cars holding 2 cords each, is run into the retorts, the doors at each end are closed, fires are started under the shell, and the wood thus carbonized. The gases from the carbonizing wood are drawn off as rapidly as formed, condensed and delivered to the by-product building for further treatment. In 18 to 24 hours the wood is carbonized and is then removed to an iron cooler of the same size and shape as the retort. In this cooler the wood remains 24 hours and is then drawn into a second cooler, where it remains 24 hours longer, being then thoroughly cooled and ready for the blast furnace. The charcoal, still on the same iron cars on which it entered the

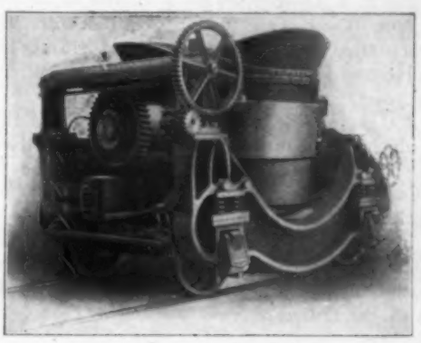


FIG 4.—HOT METAL CAR.

retort as wood, is then taken by a steam engine to the furnace, where it is used as required. The process is continuous, for as soon as a retort or cooler is emptied it is immediately refilled.

The advantage of this process is the small amount of handling given to the wood and charcoal, no manual labor being required after the cars are filled with wood until they are emptied of the charcoal. It also gives the highest yield of by-product. This plant has a capacity of 160 cords per day, yielding about 8,000 bushels of charcoal.

The kiln plant will consist of 56 kilns 30 feet in diameter at the bottom, 28 feet at spring of arch, 14 feet high to spring of arch, and 5 feet to top of arch, each kiln holding about 65 cords of wood. These kilns will be arranged in four batteries of 14 kilns each. The gases will be drawn from the kilns as formed and forced through a series of copper condensers from which the condensed product passes to the by-product plant and the combustible gases are led to the boilers. The charcoal will be forked into cars, operated somewhat upon the cable system used for street cars, by which it will be carried to the furnace at any speed desired. This plant will have a daily capacity of 150 cords of wood, yielding about 7,600 bushels of charcoal.

In the by-product building will be recovered the wood alcohol (about 100,000 gallons, 82 per cent strength, per month), the acetate of lime (about 750 tons per month) and various distillates of wood tar, such as creosote, guaiacol, etc. For the handling of this liquor there will be a boiler plant consisting of 2,400-h. p. (Stirling) boilers to be increased to 5,000-h. p. when complete plans are finished. There will also be a pumping station of 10,000,000 gallons daily capacity.

The place and method of carbonization to be adopted for the remaining 300 cords will be determined upon later on. The product for the same will all be shipped by rail to the works; the charcoal in specially designed cars to the blast furnaces, and the by-product liquors in tank cars to the by-product works described, which are capable of handling the product from 600 cords of wood per day.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

Sumner-Pounds & Co., Moultrie, Ga., is in the market for a new 12x16 (Buckeye) engine, with piston valve and self-contained sub-base.

Hardie-Tynes Foundry & Machine Co., Birmingham, Ala., is in the market for a bolt-cutting machine to cut 2½ and 2½ inch bolts.

It is reported the W. J. Brewer Engineering Co., Pope building, Washington, D. C., will shortly buy lathes, chucks, presses, drills, screws and milling machines, and small tools.

The Southern Rolling Mill Co., notice of the organization of which by Ben Catchings, Birmingham, Ala., was made in our columns last week, wants bids, specifications, etc., on the equipment for a merchant bar mill, including one heavy rolling mill engine, belting, foundations and fittings, capable of 900-horsepower; 40-ton flywheel; one 16-inch roughing mill, direct-connected with engine; one 10-inch train of finishing rolls, connected with engine by belt; complete set of rolls; electric generator, electric motor, etc.

T. C. Roberts, St. Joseph, Mo., will build a foundry and machine shop plant in the latter city. G. D. Berry, W. C. Ransom and E. T. Dengler are his associates in the enterprise.

The Franz Water Tube Boiler Co., Baltimore, Md., has been incorporated with a capital stock of $10,000 by Harry E. Karr, Herman E. Franz, Bernard A. Simm ,C. B. Page and Walter R. Metz.

Deere & Co., Moline, Ill., have purchased the site for a plant in which will be made metal wheels. It will have capacity to supply the needs of Deere & Co. and the Deere & Mansur Co. with wheels of this kind.

The Milwaukee Corrugating Co., Milwaukee, has leased a building in Bay View, Wis., where it will manufacture ornamental steel ceilings, cornices, skylights and similar products. Louis Kuehn, the president of this company, was recently connected with the LaCrosse Steel Roofing & Corrugating Co., LaCrosse, Wis.

W. H. Shenners, of Milwaukee, Wis., is promoting a company for the purpose of erecting a malleable iron foundry at West Allis. The capital stock of the company will be $100,000. Mr. G. C. Russell will be the manager of the plant.

The Engineering Construction Co., of Milwaukee, Wis., has been incorporated by C. F. Geilfuss, John Whitney and T. H. Spencer with a capital of $15,000.

Ross & Co., of Hempstead, N. Y., has been incorporated with $25,000 capital. The new concern will manufacture automatic stokers, furnaces and machinery. J. J. Sanders, A. W. Brown and R. E. Lee are the incorporators.

The capital stock of the Columbia Foundry & Machine Co., St. Joseph, Mo., has been increased from $5,000 to $12,000.

The Pennsylvania Engineering Works, New Castle, Pa., builders of blast furnace and steel plant construction have increased their capital stock from $225,000 to $500,000. The additional stock will not be issued at once, but as it may be needed for improvements.

The Syracuse Machine Co., of Syracuse, N. Y., has been incorporated with $20,000 capital. L. A. Sherbano, F. E. Allen and W. H. Porter are the incorporators.

The J. Lang Electric Co., of Chicago, has been incorporated with $15,000 capital to manufacture electrical machinery. W. D. Hawk, Robert D. Dunn and Warren Ripple are the incorporators.

The Adder Machine Co., of Elizabeth, N. J., has been incorporated with $100,000 capital to carry on the business of manufacturing and selling machine tools. S. S. Newton, Herman Meyer and S. J. Cox are the incorporators.

The Charles Creighton Foundry Co., of New York City, has been incorporated with $100,000 capital by Charles Creighton, H. A. Koelsch and J. H. Allen.

The Denver Iron Works & Manufacturing Co., Denver, Col., has been incorporated with $10,000 capital by W. J. Briggs, G. M. Sibley and John B. Sibley.

The Bakersfield Iron Works, of San Francisco, Cal., has been incorporated with $150,000. The plant at Bakersfield now operated by C. A. Canfield and J. A. Chanslor was purchased by the company. W. F. Chandler, W. A. Jacobs, W. S. Porter, O. Scribner and F. H. Buck, are the incorporators.

The Southern Foundry & Machine Co., of Nashville, Tenn., has increased its capital stock from $10,000 to $75,000.

The Standard Bolt & Manufacturing Co., of Alliance, O., has been incorporated with $100,000 capital.

The Sterling Foundry Co., of Cincinnati, has been incorporated with $50,000 capital.

The Etna Locomotive & Machine Co., of Seattle, Wash., has been incorporated. Capital, $300,000.

The Velox Machine Works, Chicago, has been incorporated. Capital, $50,000. Incorporators, C. H. Ferguson, J. M. Southworth, G. S. Webb.

The new plant of the Kalamazoo Stove Co., Kalamazoo, Mich., is completed and the company will start up this month with 45 men.

The Alganite Stove Co., of St. Louis, Mo., has been incorporated. Capital stock, $5,000. The incorporators are John R. Wettstein, Charles R. Fife and John P. Nevill.

The Newark Handy Tool Co., Newark, N. J., has been incorporated with $50,000 capital. A. Dusenberry, John Hausman, E. D. Woods, A. F. Banister and George R. Losey are the incorporators.

The Manila Electric Co., of New York, has been incorporated with $125,000 capital. The new company will install electric power plants in the Philippines and will also operate electric lines. The incorporators are Frank H. Buhl, Sharon, Pa.; P. L. Kimberley, Sharon, Pa.; M. B. DeLong, Utica, N. Y.; J. M. Ceballo, F. F. Culver, G. Whitley, and G. F. Holmes, of New York, and B. Johnson of Denver.

The C. J. Hartley Co., of Decatur, Ill., has been incorporated with $8,000 capital to manufacture engines and machinery. C. J. Hartley, Joseph Stocks and A. J. Hartley are the incorporators.

The Whitney Chain Co., of South Milwaukee, Wis., has been incorporated with $10,000 capital to manufacture chain hooks, links, etc. John Whitney and T. H. Spense are the incorporators.

At the annual meeting of the Stanley Hinge Works, New Britain, Conn., the capital was increased from $500,000 to $1,000,000. Inasmuch as there was a surplus of $500,000, the additional stock was issued to the present stockholders. A new rolling mill is now under construction and a large seven-story factory building will be erected shortly.

The Lebanon Iron & Steel Co., of Lebanon, Pa., will be incorporated on April 7, by Paul H. Denniston, H. M. Kurtz, W. E. Stokes, W. H. Triol and J. Walter White. It is probable that a plant for the manufacture of pipe will be erected at Lebanon.

The Hibben-Hill Boiler Works, of Chicago, Ill., has been incorporated with $12,000 capital, to deal in boilers. George Hibben, H. K. Hibben and J. C. Hill are the incorporators.

The Lufkin Foundry & Machine Co., of Lufkin, Tex., has been incorporated with $30,000 capital. S. W. Henderson, J. H. Kurth, E. Wienes, F. Kavanaugh, Sr., and F. Kavanaugh, Jr., are the incorporators.

The Blessing Shoeing Forge Co., of Toledo, O., has been incorporated with $10,000 capital to manufacture shoeing forges. O. Bennra, M. F. Bennra, L. S. Johnson, Frank James and C. S. Norris are the incorporators.

The National Machine Co., of Providence, R. I., has been incorporated with $100,000 capital, by C. H. Kenyon, W. S. Nye and M. V. Whipple.

The Seashore Machine Works, of Atlantic City, N. J., has been incorporated with $10,000 capital. The new company will manufacture motors. G. B. Morgan, Joseph Young, and John Beener are the incorporators.

The Southern Foundry & Machine Co., of Knoxville, Tenn., has filed an application for an increase of the capital stock from $10,000 to $75,000.

The New Jersey incorporation is announced of the Remington Metallic Cartridge Co., capital $250,000. The incorporators are Eliphalet Remington, of Ilion, Stuart Lindsley, of Orange, N. J., and Joseph M. Merrill of East Orange, N. J. The officers of the company will be: President, Eliphalet Remington; vice-president, Joseph M. Merrill; secretary and treasurer, Stuart Lindsley. The object of the company is the manufacture of metallic cartridges and ammunition. In all probability the plant will be located at Ilion, N. Y. Mr.

Remington, the president of the company, is the only surviving member of the original firm of E. Remington & Sons, manufacturers of Remington firearms, of Ilion.

The Hibben-Hill Boiler Works, of Chicago, has been incorporated. Capital stock, $12,000. Incorporators: George Hibben, H. K. Hibben and J. C. Hill.

J. J. McDougall and Benjamin Holt, of Mitchell, S. D., have purchased the machine shop of the Hawkeye Electric Co., Sioux City, Ia. They have decided to construct an additional building, and to manufacture boilers.

The machine shop and barns of the Rockford, Ill., Railway Co. are to be erected immediately at a cost of $5,030.

New Construction:—

The Normal Novelty Works, Bloomington, Ill., will erect a modern malleable iron plant for the production of small castings. In addition the foundry will be equipped to make gray iron castings, brass castings and a drop forge department will be installed.

The Arcade Manufacturing Co., Freeport, Ill., will erect a brass foundry. J. M. Heck has been appointed superintendent.

The Miller Gas Engine Co., Springfield, O., whose plant was recently destroyed by fire, has purchased a site of two acres at Springfield for the erection of a new plant. It will contain a foundry and machine shop and will be modern in every particular.

The American Tin Plate Co. will add another hot mill to its plant at Muskegon, Mich.

The Southern Car & Foundry Co. will erect a foundry 75x80 feet at Anniston, Ala. The foundry will operate on malleable iron and will supply the company's four plants in the South.

McCormick Harvesting Machinery Co., Chicago, is having plans prepared for the erection of a twine mill, 140x200 feet, to cost $160,000. This is in line with the plans which the company made some months ago, and mention of which was made in these columns.

The Domestic Gas Engine Co., Hagerstown, Md., will erect a plant for the manufacture of its engines in this city.

It is reported a foundry plant will be added to the works of the National Stamping Co., St. Louis, Mo.

The Southern Car & Foundry Co., Anniston, Ala., will erect a malleable iron foundry, 75x80 feet, according to reports from that city.

The machine shop of the Hawkeye Electric Co., Sioux City, Ia., has been purchased by J. J. McDougall and Benjamin Holt. They will erect a boiler shop in connection with the plant.

W. B. Wright has leased the plant of the American Cooperage Co., Youngstown, O., and will fit it up for foundry purposes. He is in the market for all kinds of foundry equipment.

The plant of the Milwaukee Steel Casting Co., Milwaukee, Wis., which was recently destroyed by fire is to be rebuilt immediately on a much larger scale.

The Knoxville Iron Co., Knoxville, Tenn., has awarded the contract for the erection of the buildings for its new plant to the Virginia Bridge & Iron Co., Roanoke, Va. The contract calls for the completion of the work by August 1. There will be three buildings entirely of steel. The main building will be 396x80 feet. The other two will be 240x74 and 60 feet respectively.

The plant of the Louisville Bolt & Iron Co., Louisville, Ky., which was recently destroyed by fire, is to be rebuilt immediately. The company is now in the market for nut and bolt manufacturing machinery.

The Fitzgibbons Boiler Co., Oswego, N. Y., will erect an addition to its plant. Plans are now under consideration.

A new machine shop will be erected at the Pencoyd, Pa., plant of the American Bridge Co. It will be 186x50 feet.

The Interstate Foundry Co., of Cleveland, is erecting a steel-frame building beside the Cleveland & Pittsburg Railroad.

Messrs. Reader Brothers & Hoffman, of Tyrone, Pa., some months ago began the construction of a boiler works 80x80 feet. The building has just been completed.

The Oswego Bridge Co., of Oswego, N. Y., is erecting a building 50 feet square, which will be used as a pattern shop.

A foundry is to be located on a new site in West Chicago, Ill. The main building is to be 87x200 feet, and will be ready for occupancy by May 1. Address Mr. Bolles.

The Monessen Foundry & Machine Co., of Monessen, Pa., will soon break ground on a plot below Page station for a new plant. The old foundry buildings now located on the property recently acquired by the Pittsburg Steel Co., will be razed. The capacity of the new foundry will be increased and the number of employes doubled. The new site is near to the borough line of Monessen.

The framework of the new foundry department of the rolling mill at Granite City, Ill., is completed and the entire building will soon be finished. The company will cast only ingot molds.

The Keystone Drop Forge Co. will erect a plant in Chester, Pa.

Ground has been broken for a new marine boiler and engine works to be erected near the Craig shipyards at Toledo, O. The building will be 235x100 feet.

F. M. Underwood is enlarging the Toledo Machine & Motor plant, Toledo, O. The addition will double the floor space.

The Columbus Foundry & Machine Co., of St. Joseph, Mo., will enlarge the foundry facilities. The new building will cost $5,000.

Cramp & Co., of Philadelphia, are receiving bids for alterations and additions to the E. R. Johnson machine shop at Camden, N. J.

The Pittsburg District:—

The Pressed Steel Car Co., of Pittsburg, secured a restraining order last week in the United States Circuit Court restraining John M. Hansen from conveying or assigning certain letters patent or patents pending and from interfering with the applications to secure patents. Hansen, who is now president of the recently organized Standard Steel Car Co., was formerly chief engineer of the Pressed Steel Car Co., and while acting in such capacity received a salary of $10,000 per year. While in the employ of the company, it is alleged that he agreed to assign all patents and improvements he might make, but it is alleged that he has violated this clause of his contract.

The West Penn Foundry & Machine Co., Avonmore, Pa., was awarded the contract for furnishing the machinery for the new plant of the St. Louis Plate Glass Co., St. Louis, Mo. Wilson & Snyder, Pittsburg, were awarded the contract for cranes and derricks, while Heyl & Patterson will install all the conveying machinery required in the plant.

The American Bridge Co. has been awarded the contract for rebuilding the South Tenth Street bridge. The contract price is $244,000. About 2,500 tons of structural material will be required.

The Monarch Iron & Steel Co., of Pittsburg, which was recently granted a charter in Delaware with a capital of $100,000, will erect a plant for making planished sheets adjoining the plant of the Parkersburg Iron & Steel Co., Parkersburg, W. Va. Thomas C. Perrine, F. M. Whippo and S. M. Mease are the incorporators.

The Phoenix Iron Co., of Philadelphia, has been awarded the contract for the construction of the new freight depot by the Pennsylvania railroad, which will be erected in Pittsburg. The contract calls for about 1,200 tons of material.

The Manufacturers & Producers Supply Co., of Pittsburg, has been awarded a contract for furnishing about 400 miles of 12-inch pipe by the South Jersey Gas & Electric Co., of Camden, N. J.

Application for amending the charter of the Pittsburg Stove & Range Co. in such a way that will permit the directors to dispose of the real estate and property of the company. The foundries in this district are to be sold off, inasmuch as the plants are all to be centralized at Beaver Falls. A proposition for the sale of the plant at Monongahela City has already been received, and it is probable that the plant will be disposed of as soon as authority is granted.

The George A. Fuller Co., of New York and Chicago, has been awarded the contract for the erection of the 25-story Oliver office building to be erected on Wood street. About 7,000 tons of structural material will be required in its erection.

Charles T. Schoen, inventor of the pressed steel car, has already awarded contracts for the erection of a pressed steel car wheel plant to be erected in the Pittsburg district.

The Fort Pitt Bridge Co. has been awarded the contract for the erection of the addition to the plant of the Fischer Foundry & Machine Co., South Side, Pittsburg.

The National Bridge Co., of Pittsburg, has awarded the

contract for the erection of a large traveling crane for its new structural plant to the Browning Engineering Co., of Cleveland. The contract for the gas engines was awarded to the Westinghouse Electric & Manufacturing Co.

The Cumberland Sheet & Steel Co., Cumberland, Md., will install 16 and 20-inch mills for the rolling of light rails in 16 to 40-pound sections. The mills will be placed in operation within 60 days. The forge department of the plant will be placed in operation within a few weeks.

The Continental Iron Works, Wheatland, Pa., will install a combination merchant mill with 12, 16 and 20-inch stands of rolls. General Manager Truxall reports a large amount of business on the books of the company, and states that considerable new machinery will be shortly installed.

The Central Iron & Steel Co., Harrisburg, Pa., will erect an open-hearth plant consisting of four 50-ton furnaces. The Harrisburg Pipe & Pipe Bending Co. will also put in an open-hearth furnace with a capacity of about 60 tons daily. A blooming mill together with a skelp mill will also be erected.

The Republic Iron & Steel Co. has decided to erect two additional finishing mills at the Brown-Bonnell Works, Youngstown, O. The two merchant mills decided upon are 8 and 10-inch respectively, and the erection of a 7-inch mill is under consideration. To make room for these improvements it has been decided to raze No. 1 puddle mill, built in 1846, which is probably one of the oldest mill properties in Youngstown. At the Bessemer plant of this company a 48-inch blooming mill will be erected, contracts for which will be erected shortly. This mill will replace the present blooming mill which will be torn down.

The American Tube & Stamping Co., Bridgeport, Conn., will shortly erect an open-hearth plant with a daily capacity of 200 to 300 tons per day. A modern blooming mill will also be erected. Ultimately a blast furnace may be built, using foreign ores.

The Buckeye Engine Co., Salem, O., will erect a pattern shop 120x80 feet and two stories high. The building will be of brick and modern in every particular. A large amount of wood working machinery will be installed.

The Grand Crossing Tack Co., Grand Crossing, Ill., has bought for $125,000 a 50-acre tract, with 1,200 feet of frontage on the Calumet river, between One Hundred and Eighteenth and One Hundred and Twentieth streets, Chicago, and will build thereon a plant to cost $500,000. The plans for the plant call for a group of twelve buildings to contain 70,000 square feet of floor space, in which will be included an open-hearth steel department, rolling mill for the manufacture of billets, etc. The company's present plant at South Chicago avenue and Seventy-ninth street has been rendered inadequate by the rapid increase of business. The main building will be 440 feet long by 60 feet wide. E. W. Hutchinson, secretary and superintendent of the company, has recently returned from Europe, where he went to inspect some modern plants of the kind.

The Illinois Car & Equipment Co., Hegewisch, Ill., has made plans for the extensive improvement and enlargement of its works.

The Western Electric Co., Chicago, is having plans prepared for three additional buildings to its plant in that city, which will be erected at a cost, exclusive of machinery, of $150,000.

General Industrial Notes:—

Notices of a special meeting of the stockholders of the Tidewater Iron & Steel Co., Chester, Pa., to be held on May 7, have been sent out. The meeting has been called for the purpose of considering the issue of additional preferred stock, bearing 8 per cent cumulative dividend to the amount of $6,000,000. In his letter to the stockholders President Stafford takes a very cheerful view of the company's future. With the erection of several additional open-hearth furnaces, and with certain extensions to the blast furnace and blooming mill, the finishing capacity can be increased to such an extent that the earnings will be increased to fully 20 per cent on the common stock, including the regular dividends on the preferred. At the present time he states that the company is earning 10 per cent. The Investment Co. of Philadelphia has agreed to underwrite the stock.

On April 1 the Republic Iron & Steel Co. will blow in its new furnace at Thomas, Ala. All the officers of the company will be present, and at the same time the new 400-oven coke plant will also be placed in operation. With this new furnace the Thomas plant of the Republic Iron & Steel Co. will have a daily output of about 600 tons. The four batteries of coke ovens at this plant number about 1,000, being one of the largest coke plants in the South.

C. C. Wormer Machinery Co., Detroit, Mich., announces that Byron E. Parks, mechanical engineer, formerly of Grand Rapids, Mich., has become associated with the company and will have entire charge of the engineering department as well as of the sales department for engines, boilers, steam plant appliances and electrical machinery. It is the intention to make this department a prominent feature of the business, and the firm intends to conduct an engineering business, designing, drawing plans and specifications, supervising erection of work, also contracting for complete plants.

The South Bend Chilled Plow Co., South Bend, Ind., continues to make improvements with a view to materially increasing its capacity. The installation of a new 60-h. p. engine has been completed and another steel furnace will be put in operation next week.

It is reported that the Huntsville Foundry & Machine Works, Huntsville, Ala., will establish a department for the manufacture of plows.

The Heine Safety Boiler Co., St. Louis, has received an order for three 200-h. p. and three 250-h. p. boilers for installation in an electrical power plant in Australia.

The annual meeting of the Sloss Iron & Steel Co. will be held at Birmingham, Ala., Wednesday, April 2.

The foundry of the Christensen Engineering Co., Milwaukee, Wis., which was closed for several weeks, has again commenced operations. The report that negotiations are on foot for the sale of the plant to the Westinghouse Air Brake Co. is officially denied.

The new foundry of C. H. Hopke, at Rockford, Ill., was placed in operation last week. It will make gray iron castings entirely. The foundry is 125x80 feet, and the machine shop 100x40 feet.

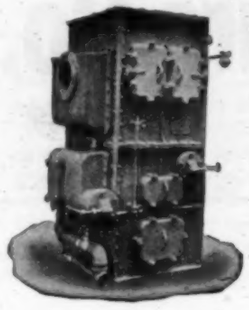
The Hager Rolling Mill at Granite City, Ill., commenced operations last week.

We have already made announcement of the organization of the Iroquois Machine Co. under a New York charter, by W. W. Gibbs, who is also vice-president of the Kidder Press Co., and a member of Gibbs-Brower Co., of New York City. The president, Edwin A. Smith, is a prominent banker in Providence, R. I. W. W. Gibbs is vice-president and general manager, and Henry C. Babcock, of Providence, secretary and treasurer. The principal office is at 150 Nassau street, New York, in charge of Mr. Gibbs. The company will manufacture new and improved wide drawing machinery, which it is claimed, will materially reduce the cost of producing wire. It will also manufacture a full line of automatic and plain drop hammers, swaging machines, rolling mills for jewelers' work, roller bearings and grinding machines. Having ample capital, it has purchased the plant and business of the Universal Machine Co., well known as a manufacturer of grinding machinery, at Providence, R. I., and rented a large additional building adjacent to the same. The purchase of this running plant and the addition named, will insure the prompt filling of orders. It is stated that the company will erect a new factory building in the coming summer. The swaging machinery which the company will manufacture will be special in its provision for the automatic opening of dies.

The Louisville Bridge & Iron Co., Louisville, Ky., re-elected its retiring board of directors at the annual meeting held in Louisville March 3. They are as follows: James McCrea, J. J. Brooks and Joseph Wood, all of Pittsburg; Charles H. Gibson and John L. Dodd, of Louisville.

McCord & Co., Old Colony Building, Chicago, has appointed John S. Small, formerly mechanical engineer of the Link-Belt Machinery Co., Chicago, as its traveling salesman.

The Republic Iron & Steel Co. has placed an order with Morgan Construction Co., Worcester, Mass., for three roughing trains to supply material for merchant bar mills at the Brown-Bonnell plant, Youngstown, O. The order also includes an automatic straightening and cooling bed, five Morgan gas producers with Bildt patent automatic feeds and three Morgan suspended roof billet heating furnaces.



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This waste product is designated as exhaust steam, and exhaust steam from condensing engines has within 5% of the total value of live steam for heating purposes; that is, less than 5% of the heat has been taken out of the steam in doing work with a non-condensing engine—less than 17% with a condensing engine.

You will be interested in knowing something about an appliance which will give the fullest advantage of exhaust steam for heating water, and for use in heating buildings; for this, steam must first be purified from the cylinder oil with which it is contaminated—provision must be made for heating the boiler feed supply—provision must be made for saving all the condensation, and for supplementing with as little fresh, impure, cold water as is required to make up the quantity needed by the boilers.

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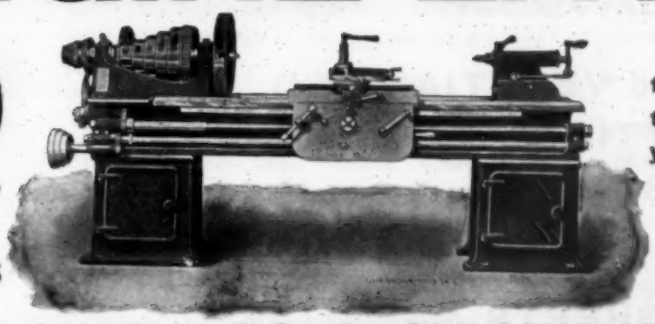

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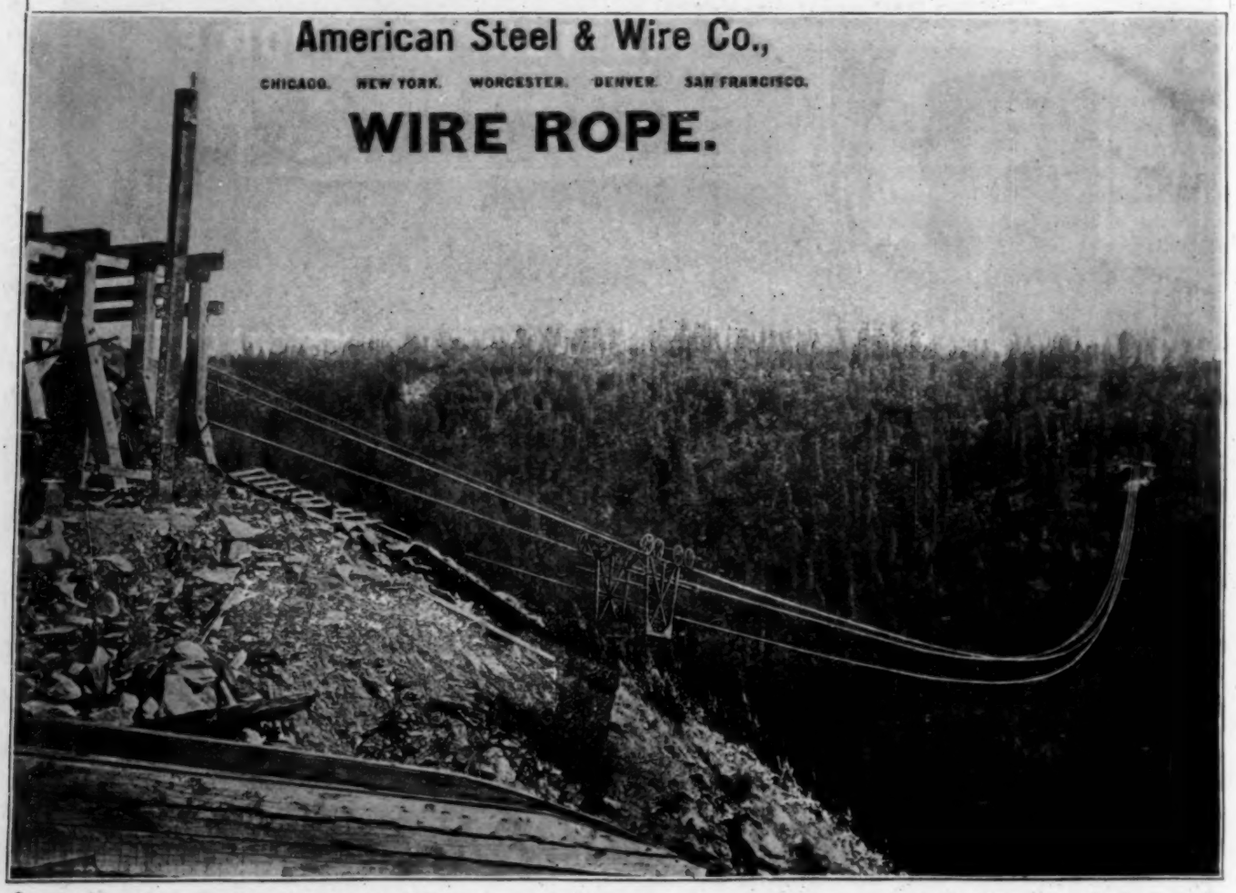

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UP-TO-DATE MANUFACTURERS realize this and are equipping their mills with our machinery, paying the extra price. You had better look into this matter—it may save you dollars. Shall be pleased to hear from you.

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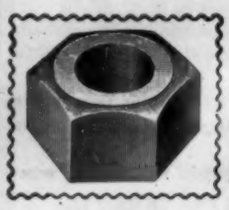

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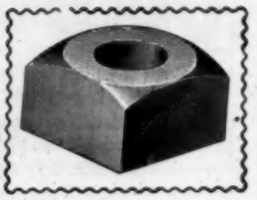

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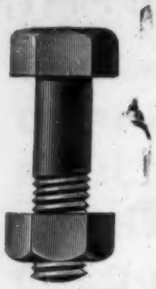

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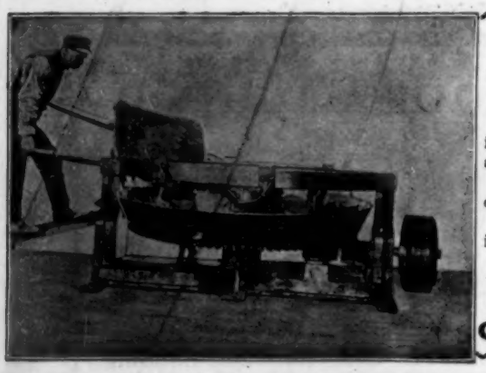

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